The Electrical Industry's Weekly Magazine

August 31, 1959

Electrical World

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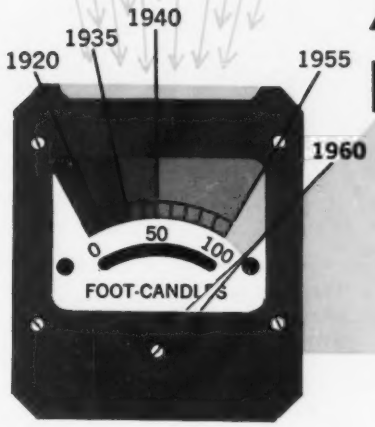
A McGraw-Hill Publication

Annual Lighting Progress Report:

New Lighting Levels— A $15 Billion Potential

. . . p 61



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- **Quake Damage Studies At Hebgen Dam** ..... p

UNIV MICROFILMS INC
EDITORIAL DEPT
313 N FIRST ST

ALLIS-CHALMERS modern line for '59

A-C Introduces New Static Relay

COLLEGE STATION, Texas, April 13 — Over 300 relay engineers and scientists witnessed another example of the Electronic Age today when Allis-Chalmers introduced a new static protective relay. The new development was disclosed in an engineering paper presented by John Baude, Allis-Chalmers engineer, before the Twelfth Annual Conference for Protective Relay Engineers.

The new relay, designed for industrial switchgear application, is the first major departure from conventional relay construction in 50 years.

NO MOVING PARTS

Of particular significance is the elimination of all moving parts through the use of semi-conductors such as transistors, diodes, thermistors, and varistors. Use of these components combined

Small size saves panel space.

FIRST

completely static protective relay!

. . . available in Allis-Chalmers switchgear

This highly reliable *new* protective overcurrent relay has no moving parts . . . it's static, and it's only ⅓ the size of conventional relays.

Employing transistors, printed circuits, and other electronic components encased in epoxy-resin, A-C static relays are shock and moisture resistant They're unaffected by temperature changes, operate with low burden, and have instantaneous reset feature. Quick plug-in construction makes replacement easy.

Want more protective relay-equipped switchgear facts? Contact your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-1157-E

ALLIS-CHALMERS

Electrical World

Vol. 152, No. 9 AUGUST 31, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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New Lighting Levels

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After 28 years on the job . . . Okolite insulation still looks good. This unretouched photograph shows a section of 11.5 KV power cable recently re-assigned by Duquesne Light Company. Notice that the insulation is still flexible and resilient—workable. Tests made this year show the tensile strength has deteriorated very little, remaining more than 33% above the original specification figure.

Duquesne gives "Old Faithful" a new assignment

30-year-old Okonite cable still tests above industry specification figures

"Old Faithful"—a 1250 MCM, Okolite-insulated power cable, made by Okonite's strip process back in 1929—is carrying on a new career as a mine power feeder, reports Duquesne Light Company of Pittsburgh.

When it first entered service in the Roaring Twenties, this remarkable cable was an 11.5 KV lead from switchyard to transformer. It was installed in two 8″ steel pipes —three cables per pipe, 2 cables per phase—and handled 15,000 KVA loads.

By 1942 power demands had increased and the cable began fifteen years of full load operation, 24 hours a day. And in 1957, "Old Faithful" yielded to Duquesne's need to supply still more power. It was replaced by a larger cable to handle the new 25,000 KVA load. At that point the veteran Okolite construction was pronounced perfectly suitable for its new assignment.

Okonite still makes cable as it did in 1929—only better. Braid has given way to metallic tape and neoprene. Okolite insulation has been systematically improved. (Today, you can't beat its combination of high dielectric strength, resistance to ozone, moisture, and heat.) But Okonite's ability to provide the most dependable cables on the market has never changed.

THE OKONITE COMPANY
Subsidiary of Kennecott Copper Corporation
Passaic, New Jersey

where there's electrical power . . . there's **OKONITE CABLE**

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LETTERS

Welcome to Dreamers Club

To the Editor:

With less and less infiltration air being allowed into new homes, smoke and odor-laden air becomes more of a problem. Electrostatic precipitators offer the ultimate in relief but are quite expensive. The main requirement is a high voltage, low power, dc supply. This is already present in most homes in the ever-present TV.

Why not induce some TV maker to market a combination TV-air purifier? It could be rigged so that either the TV or the purifier could be used. The purifier might cause too much TV interference to use both simultaneously in the same cabinet.

Air movement could be by natural draft or a small fan. A plug-in electrostatic system that could be rinsed off under a faucet would be desirable.

The TV manufacturers would have a new "gimmick" to help stimulate sales. Utilities might pick up a few extra kwhr on every TV plus a better load factor, and TV sets could, at last, become useful appliances.

V. C. Schumacher
301 Cleveland Avenue, S. W.
Canton 2, Ohio

ACSR Fault Currents

To the Editor:

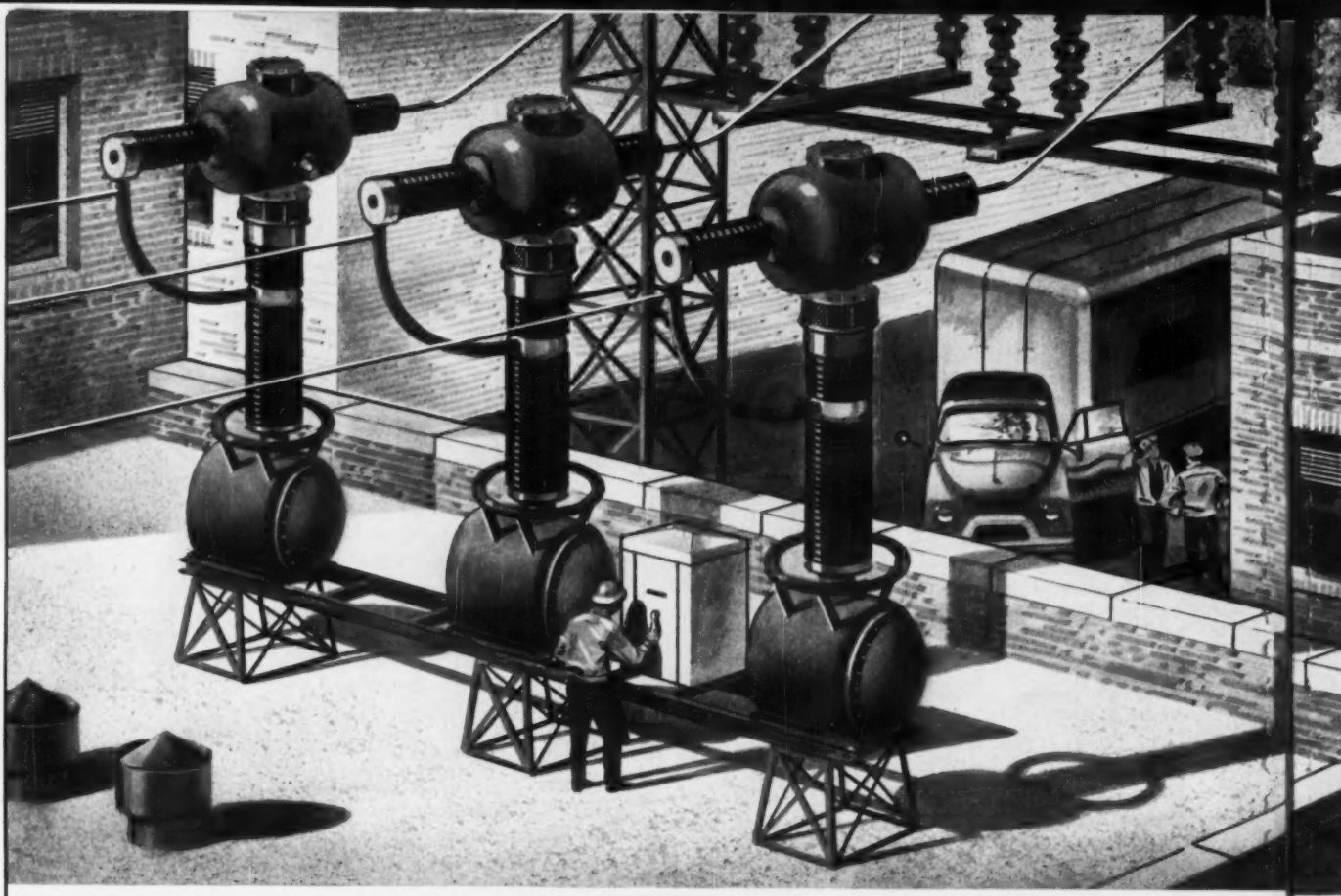
There appears to be something missing on Engineering Reference Sheet No. 59-15 appearing on page 72 of your July 27 issue. The chart does not specify whether it applies to all aluminum or ACSR conductor, but it does not agree with the formula for either conductor.

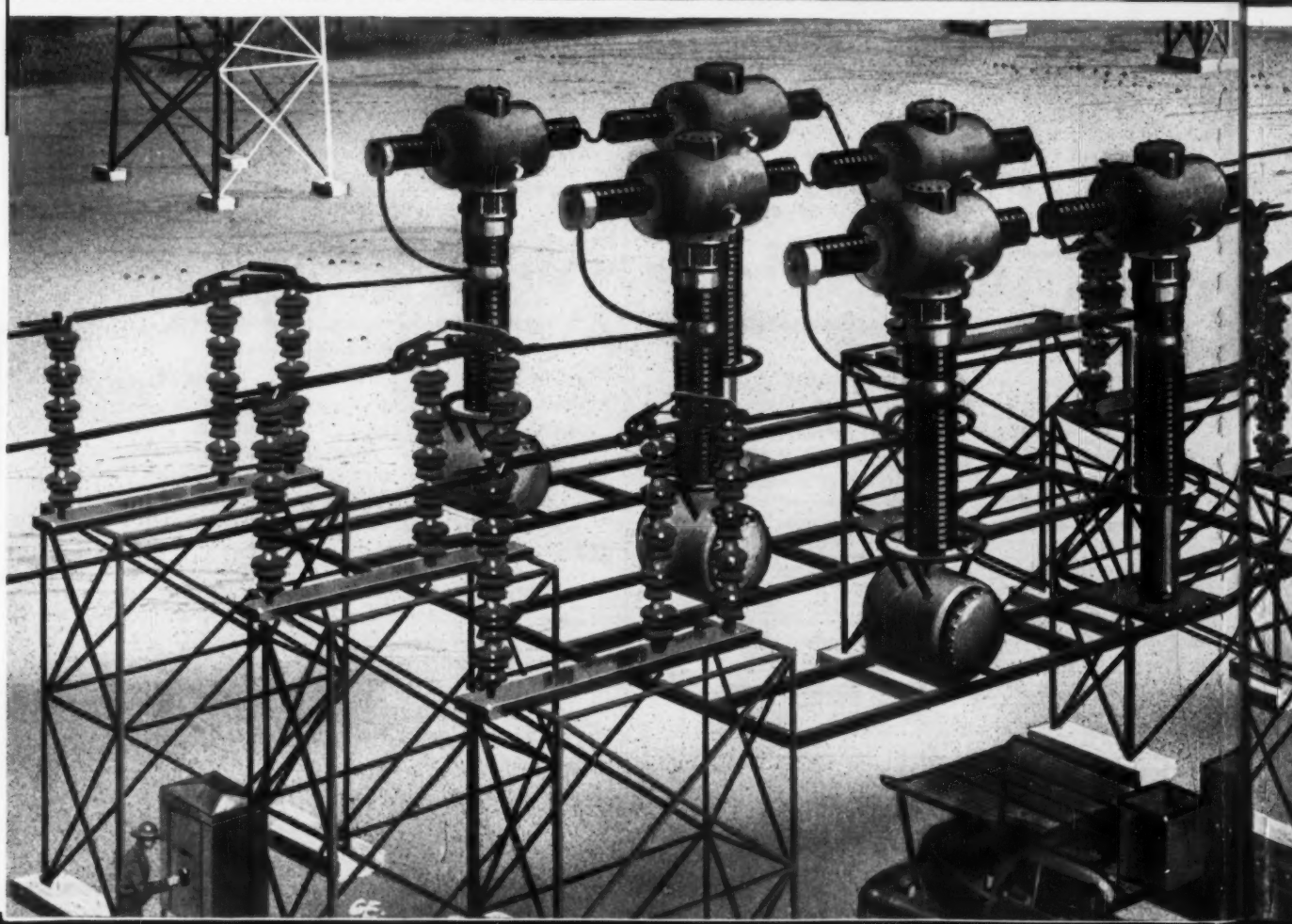
Paul A. Oakes
System Analysis Engineer
Idaho Power Co
Boise, Idaho

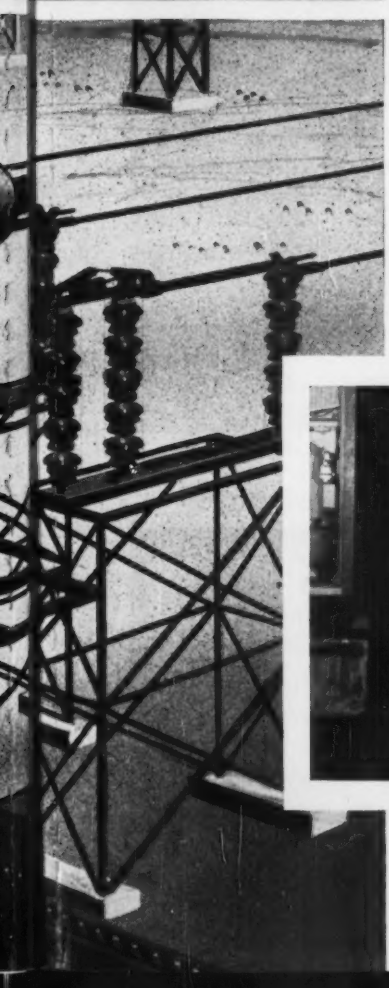
An exponent was dropped in printing. The formulae should read:

$$t = \begin{cases} \left(0.0671 \frac{M}{I}\right)^2 \\ \left(0.0862 \frac{M}{I}\right)^2 \end{cases} \begin{matrix} \text{— Stranded Aluminum} \\ \text{— ACSR} \end{matrix}$$

The chart illustrates properties of ACSR conductors only.







NEW General Electric AIR BLAST Power Circuit Breakers give you . . .

Installation flexibility never before possible

General Electric's new Type ATB Air Blast Circuit Breakers offer you installation flexibility never before possible with oil breakers. You can install Air Blast units on roof tops or on switch structures. Either way, you gain aisle space and save valuable ground area.

General Electric's Air Blast design saves station space in another way, too. The Type ATB is the only Air Blast breaker line available today which offers current transformers as an integral component. Where applied, the gas-insulated CT serves as the base of a column.

Air Blast breakers are 30 to 50% lighter than comparably rated oil units. For this reason, and because no impact forces result from interruption, breakers can be installed on roof tops or in switch structure. When breakers are installed at ground level, concrete required for foundations is drastically reduced. Under average soil conditions, a 230-kv oil breaker requires 31.6 cubic yards of concrete for its foundation. A 230-kv Air Blast unit needs only 7.5 cubic yards.

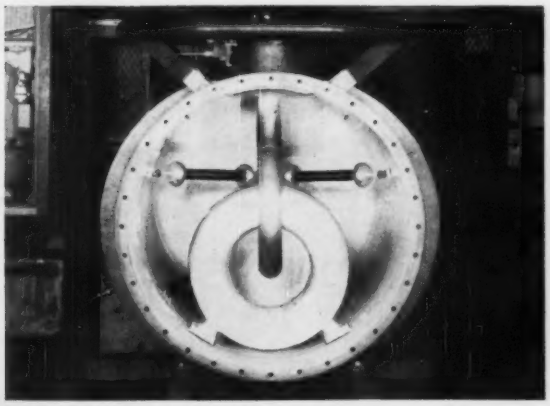
Once foundations are in place, actual installation of the breakers is relatively simple. Current transformer and insulating columns are shipped as a unit and may be handled with a light-duty crane. The interrupter heads are shipped complete, ready to be bolted in place.

The location of the breaker control cabinet is flexible too. It can be mounted upon the breaker structure, or at ground level, whichever you prefer.

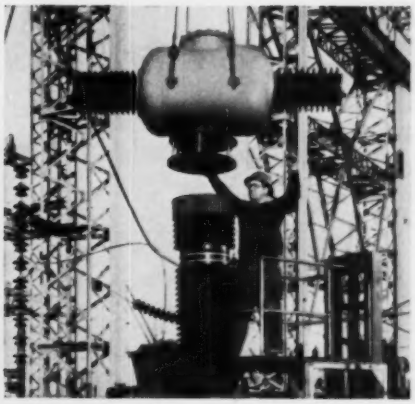
Easier, more flexible, less costly installation is just one of the many major benefits inherent in G-E Air Blast Breakers for transmission voltages. Ask your General Electric Apparatus Sales Engineer to tell you the full story. General Electric Co., Schenectady 5, New York. 494-2

Progress Is Our Most Important Product

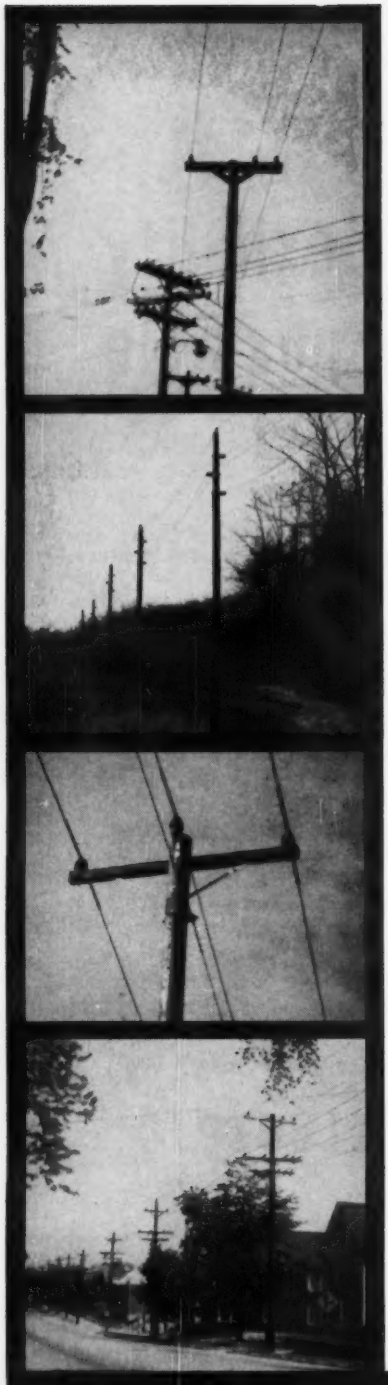
GENERAL ELECTRIC

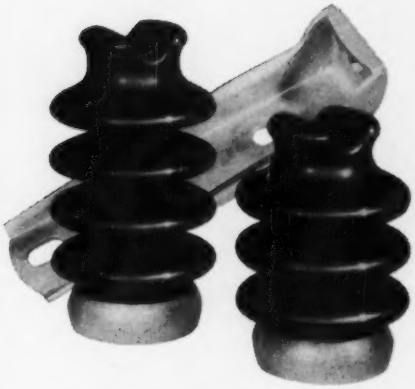


TO SAVE SPACE and reduce components, current transformers are an integral part of the breaker.



ONLY ONE LIGHT-DUTY crane is required for air blast installation. Interrupter heads are shipped complete.





LAPP DISTRIBUTION POSTS

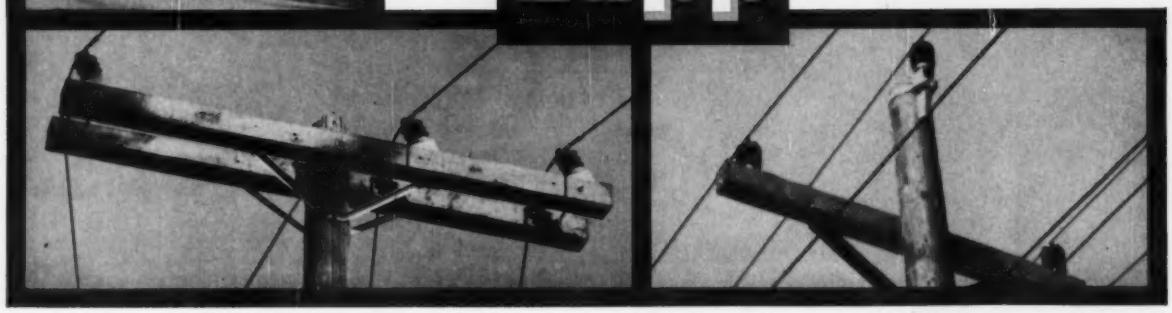
Line Post reliability for distribution lines up to 27 kv

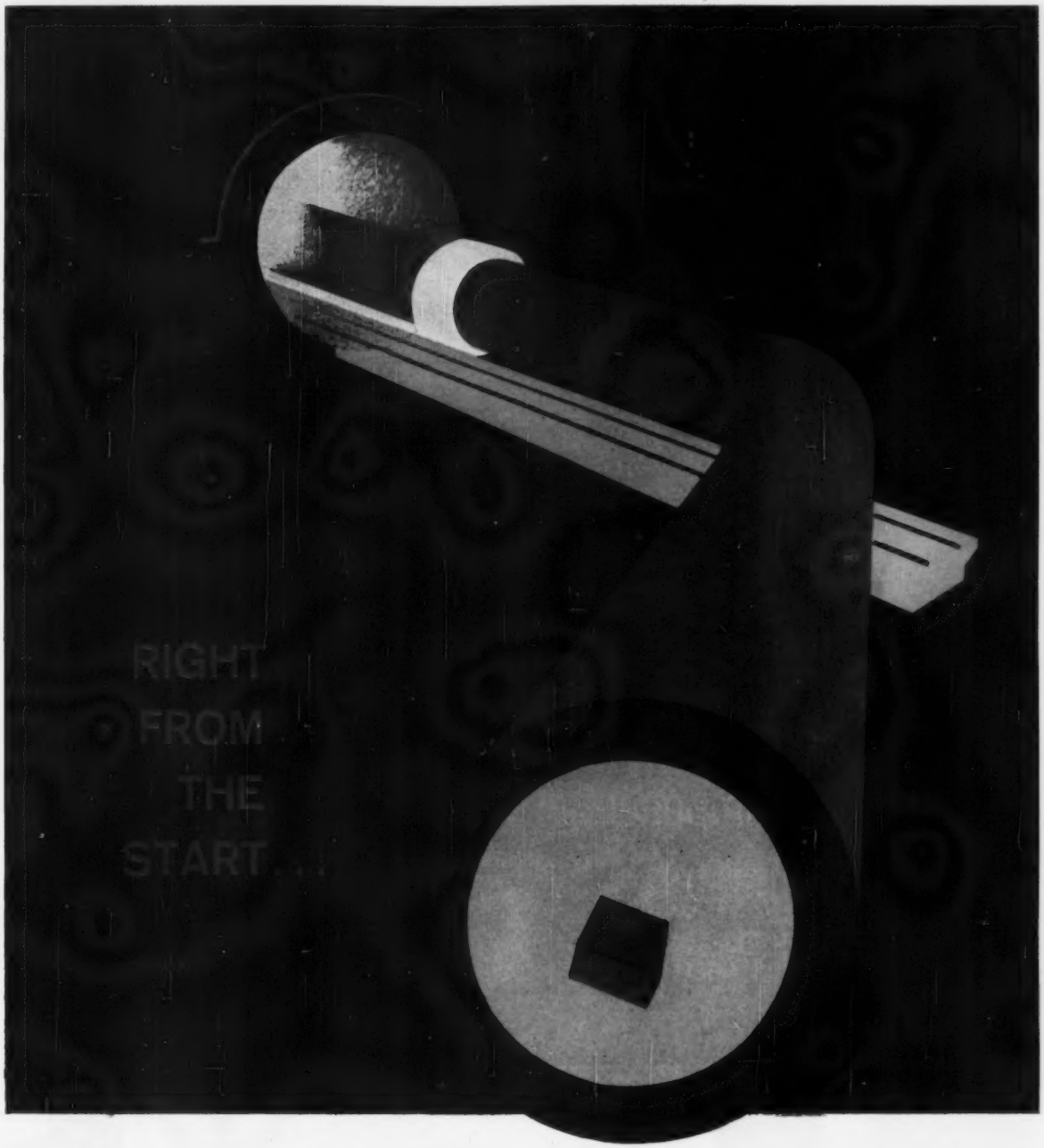
No distribution line you can build will serve as dependably, save as much sleep for your maintenance crews, or build as much customer good-will, as the one you put on Lapp Distribution Posts. These trim-appearing "junior Line Posts" just won't puncture . . . their solid one-piece porcelain body separates conductor from ground for its full length. Won't crack either . . . the only metal-to-porcelain joint is at the base; loading of porcelain is only in large-area, low-intensity compression. Greatly more resistance to flashover and impact, too . . . has short super-sturdy petticoats, with extra protection against failure in the fact that when petticoats are broken away, the post body remains intact with almost its full insulating values. Completely free of radio- or TV-interference at any operating voltage. Fog-type for superior performance in dust or atmospheric contamination.

Where else can you get so much for so little cost? Better look into it.

Lapp Insulator Co., Inc., Le Roy, New York.

Lapp



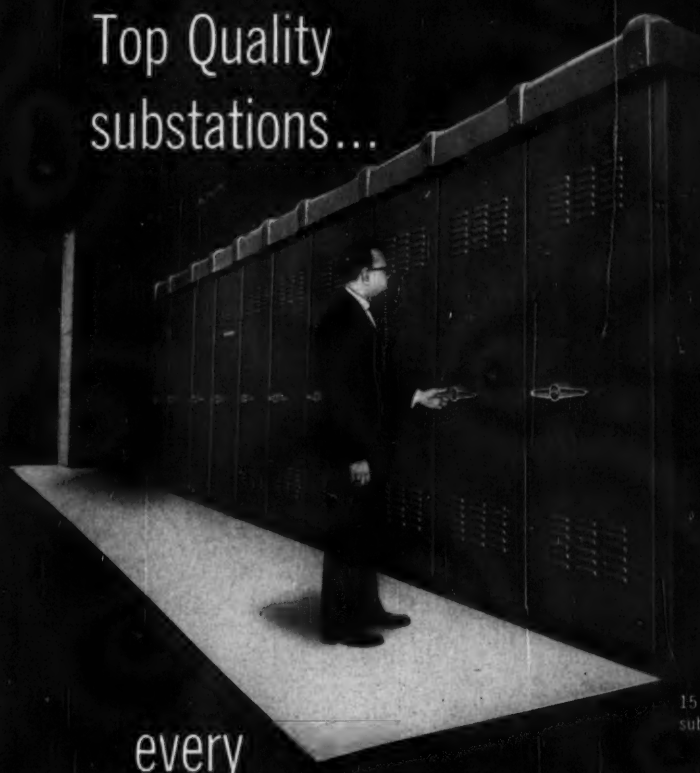


When piping costs come close to the million mark — when the installation is vast, and the leeway for error is small — a piping job must be right from the start to finish. Grinnell assures this through complete one-company control and responsibility. From interpretive engineering — through exclusive methods of prefabrication and testing of pipe and hanger units — to precision assembly and delivery, the job is all done by Grinnell, as only Grinnell can do it. The result: installations of any size, at costs known before you start, with assured performance. Grinnell Company, Inc., Providence, R.I.

Current Grinnell piping responsibilities. Enrico Fermi Atomic Power Plant, Michigan; Ohio Power Company, West Virginia; National Aniline Division of Allied Chemical & Dye Corporation, Virginia; Memphis Light, Gas and Water Division, Tennessee; Aluminum Company of America, Indiana; South Carolina Electric & Gas Company, South Carolina; Duke Power Company, North Carolina; Union Bag-Camp Paper Corp., Virginia; Pennsylvania Power & Light Company, Pennsylvania; Holyoke Water Power Company, Massachusetts

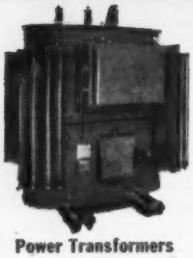
GRINNELL

Top Quality substations...



15 kv outdoor primary unit substation styled by Raymond Loewy

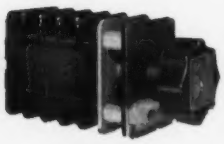
every major component manufactured by Federal Pacific



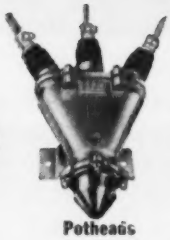
Power Transformers

Protective Relays

Indicating Instruments



Instrument Switches



Potheads

High Voltage Air Breakers

For single-source responsibility and reliable operation, look to Federal Pacific, one of only three companies to manufacture every major component of its primary unit substations. Federal Pacific's unit engineering, coordinated assembly, integrated quality control assure you built-in reliability and longer substation life. Federal Pacific Electric Company, General Offices: Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

The Electrical Week

LATE NEWS ▶ **Broadening impact of steel strike is noted by utilities** who report deeper load cuts in some areas, possible effect on September construction. Northern Indiana PS industrial load off 20% . . . Commonwealth Ed losing 35 million kwhr a week, but says fuel reductions help offset lost revenue . . . Pacific G&E and Cleveland Electric see slowing of tower work if strike continues. Southern Colorado Power feels "little bit" of dip as some steel-allied industries shut down . . . Copper union's walkout cuts Montana Power sendout by 150 Mw.

Nonetheless, kwhr output is booming. Sendout cracks 14-billion kwhr mark. It happened during week of Aug. 22 (see below).

U. S. Bureau of Reclamation isn't working "aggressively", co-ops charge, to find new ways of supplying them power in Upper Missouri Basin. They urge purchase of 200 Mw from Nebraska, a big steam plant, an EHV line, and/or assumption of utility responsibility.

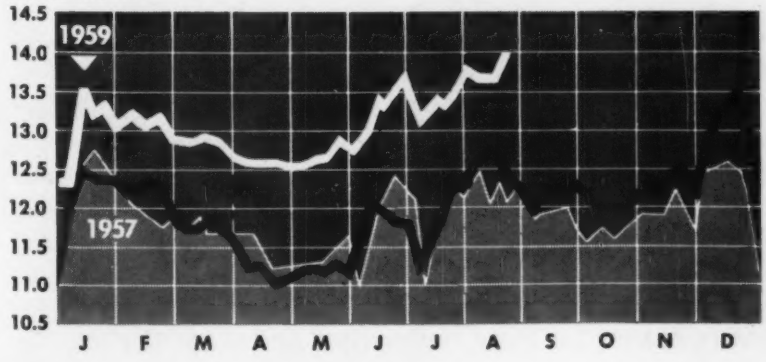
Central Louisiana goes into gasoline business as company begins building $260,000 plant in St. Mary's parish.

Rates and Regulation . . . Boston Ed gets second rate hike of $4,203,000 a year, allowing 5.7% rate of return . . . Cuban Government orders Cuban Electric to cut rates by 30.4% in metropolitan Havana . . . Kentucky Power asks PSC approval to up rates $100,000 a year on Oct. 1 . . . Alabama PSC approves contract for sale of power by Alabama Power to Evergreen. City said agreement with company would save it $11,000 a year over that with co-op.

Management changes . . . At American & Foreign Power R. A. Lucey, W. J. Rolfs, J. G. True and W. S. Nydorf become vps.

Obituaries . . . Charles E. Ide, 67, president and general manager of Toledo Ed . . . A. T. O'Neill, 74, president, Canadian Niagara Power.

WEEKLY POWER OUTPUT—UP 12.1% (Week ending Aug. 22), Kwhr 14,003,000,000



Per Cent Change From Previous Year

	Aug. 8	Aug. 15	Aug. 22
Total U. S. ...	+ 7.6	+ 6.2	+12.1
New Eng.	+ 4.2	+ 8.4	+14.8
Mid. Atlan. ...	+ 3.7	+ 7.0	+20.6
Cent. Ind.	+ 5.8	+ 4.0	+12.1
West Cent. ...	+ 8.6	− 0.6	+11.6
Southeast	+ 6.0	+ 5.1	+ 9.2
South Cent. ..	+12.0	+ 6.8	+ 9.9
Rocky Mount...	+10.5	+ 7.3	+ 5.6
Pacific			
NW	+16.7	+15.2	+15.9
SW	+12.1	+11.5	+ 7.9

Seasonally Adjusted Index 260.6
Week Ago 251.1 Year Ago 233.3

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **New York power outage stemmed from coincidence,** not overloads or high temperature, Con Edison says in report. Rapid-fire series of 13.8-kv feeder cable faults interrupted service for 500,000 people Aug. 17 **(p 54).** Earthquake that jarred Northwest caused three cracks in Hebgen Dam's concrete core but the 44-year-old structure escaped major damage **(p 57)** . . . Legislation aiming for a permanent "Natural Resource Council" and a "Joint Congressional Committee on Natural Resources" has been introduced in House-Senate **(p 59).**

ENGINEERING ▶ **Dual-ratio transformers lower conversion costs** for Cleveland Electric Illuminating Co. Company will save $15 per unit in converting low-load density areas from 4,800 v to 7.62/13.2 kv **(p 79).**

SPECIAL REPORT ANNUAL LIGHTING PROGRESS REPORT ▶ **Utilities have turned their eyes to the higher lighting levels** of the "Blackwell Report." This year's lighting progress report shows that most utilities are very conscious of the newer levels and their implications; that they have adopted a "practice what we preach" attitude in selling them; and that they are even looking beyond today's levels to the higher ones of tomorrow **(p 61).**

MANUFACTURERS ▶ **S&C Electric to announce new "Circuit Buster" for 69, 138 kv,** and

Politics and Public Power

CONGRESS' POWER SCORECARD

It could have been worse. That's how you might sum up Congressional action during 1959 on power matters, if you only were looking at the surface on spectacular issues.

However, most of the power-related legislation enacted this year contains far more dangerous precedents for the future than what was mentioned by its sponsors. For example:

• Trinity Power Facilities. Congress voted funds to start work on a federal power plant at Trinity Dam, and it also killed an alternate plan for Pacific Gas & Electric Co to build the same plant. Public power advocates reasoned that it was logical to build a federal power plant at a federal dam, and federal power should be sold to preference customers without going through a private middleman.

Trinity, however, was a standard-bearer for the Eisenhower Administration's "partnership" program. Its demise buried hope for similar projects.

• Public Works Appropriations. Congress showed more than token opposition to the President's "no new starts" policy for federal projects by voting at least 75 new construction starts for fiscal 1960. This year's long list contains few power-related projects (compared to the $1.2-billion funds voted), but the door has been forced open, and a budget-minded President must face the fact that it may be politically impossible to keep new construction starts out of future bills.

• TVA Bonds. President Eisenhower signed a bond bill which, although corrected to his wishes, sets two precedents which some industry observers regard as unhealthy: (1) The whole principle of federal agencies being allowed to handle their own finances, free of congressional control, opens the door for other "valley type" groups—particularly the

perhaps higher . . . TVA spent 27% of its business abroad during year ended June 30 . . . J. P. Devine to build vacuum-drying impregnation system for Ohio Edison's transformer renovating plant **(p 96).**

PROCUREMENT & PRODUCTS ▶ **The grand jury probe into electrical manufacturers' pricing** policies could last well into 1960. Meanwhile, Sen Kefauver (D-Tenn.) plans to open his investigation in Knoxville when Congress quits **(p 94).**

NEW EQUIPMENT ▶ **H-V Power Switch in 230-kv, 900-kv BIL model extends line** of power switches . . . Pole aligner is designed to handle any pole . . . Distribution center with improved insulation is 30% smaller **(p 102).**

MANAGEMENT ▶ **Electric utilities' net incomes rose 9.1%** for the twelve months ended June 30, 1959 compared with the preceding twelve months. The leading region was the East South Central, with an average gain of 11.1%. Florida companies improved net incomes by about 12%. Many "big city" power companies also showed good gains, headed by Commonwealth Edison's $15 million rise **(p 109).**

SELLING ▶ **Kansas motel owner goes to electric heat,** pegging promotional rates and consumer benefits as his reasons for doing so **(p 117).**

"Bonneville Power Corporation" proposed by Sen Richard Neuberger; (2) The 11 specifically exempted towns (permitted to use TVA power outside its service area) are an indication of the bill's loopholes. Watch for attempts to expand this list of 11.

Committee action on other power issues, not ready for a vote, shows a steady push for federal "responsibility" to supply all preference customer power needs—either by firming up hydro plants with thermal plants, or by building huge transmission lines to interchange power with other federal or public systems. For example:

• Bonneville-California Intertie. The Senate Interior Committee is pushing a study for a huge (300 or 400 kv) federal power line between Bonneville Power Administration and the Central Valley Project as an alternative to what it calls an "inadequate, monopolistic" line, proposed by PG&E.

• The same committee, backed by co-op howls, is pressing the Bureau of Reclamation to increase firm power deliveries to Montana and Dakota preference customers, either by building a lignite-fueled thermal plant or by adding transmission lines to interconnect with other federal or public systems.

• Several investigations, one into water resources and a proposed one into nation-wide power needs, appear aimed at pushing construction of a federal power transmission grid to make "most efficient use" of the nation's water and water resources.

True, public power supporters suffered a few set backs: (1) A new push for a federal Hells Canyon Dam failed to develop, (2) Neuberger's Bonneville Power Corp bill was stalled for lack of support, (3) Congress upheld the President's veto of the Price-Humphrey bill. But these were short-range victories.

Nuclear Notes

New insight on the unsolved problem of controlling thermonuclear power has been uncovered by two U. S. scientists associated with the Navy. The team has bottled heavy hydrogen in a magnetic field under higher temperatures and for longer times than ever before. Photos showed neutrons pouring out as temperatures rose in the magnetic bottle to between 10 and 30 million degrees—the range required for nuclear fission. Next step will be to try to measure the temperature in the magnetic bottle. No claim is made that this scientific step has made a controlled thermonuclear reaction possible.

Report of the U. S. scientific achievement by Drs Alan C. Kolb, Naval Research Laboratory and Prof Hans Griem, University of Maryland, came at the Fourth International Conference of Ionization Phenomena in Gases at Uppsala, Sweden.

British Industry leaders are voicing alarm at the high cost of U.K. nuclear power plant pioneering and the losses being incurred on five plants now building. British GE's Sir Leslie Gomage concludes that "nuclear power plants are too expensive and that as a result the market will remain limited. An extensive new approach—is necessary to reduce capital costs." H. G. Nelson, managing director of English Electric, recently said development of atomic power is extremely costly and the volume of business may not be enough to pay costs incurred.

Five British Consortia or groups of companies have each won a contract for a U. K. nuclear power station now building. It has been suggested that the five groups be reduced to three so there can be a bigger share-out of the limited demand to offset the vast individual research and capital cost.

Notable new nuclear literature includes:

"Electric Power from the Atom" is newly revised edition of EEI's popular 28-page exposition of what nuclear power can mean to U. S. power users, how it works, and what electric companies are doing to develop it. ($0.25)

"Siting of Nuclear Power Reactors" is a 24-page report of Atomic Industrial Forum of discussions at meetings of EEI's Technical Appraisal Task Force and the Forum, regarding AEC's proposed amendment to regulations for locating nuclear power and test reactors. ($2.00)

"Guide to Shipment of U-235 Enriched Uranium Materials" (TID-7019) a 75-page AEC publication prepared to provide a pattern of basic procedures to guide engineers, physicists and chemists responsible for nuclear safety in plants that ship enriched uranium. This is not a regulatory document. Obtain it via Dept of Commerce, Office of Tech. Service. ($1.00)

FUTURA

insulators help you prepare for the

GOLDEN YEARS

will you have an insulator corrosion problem?

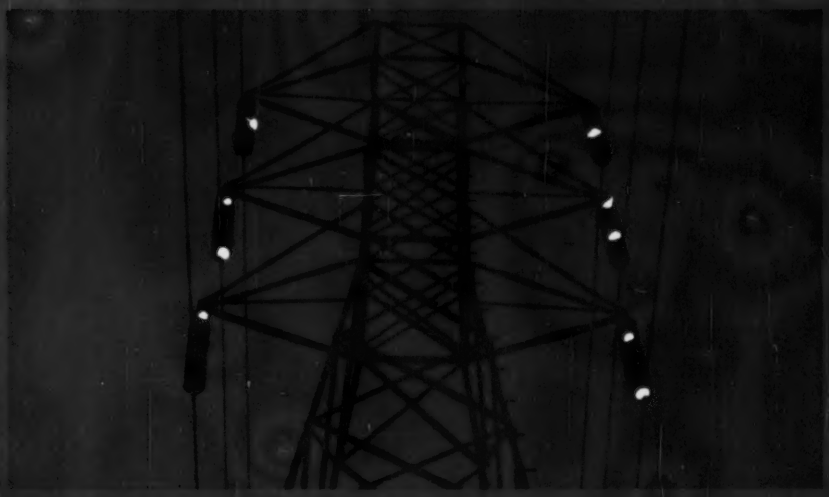
The already high quality of insulating porcelain continues to improve, aided by new knowledge of ceramics and how to use them, mechanization, and effective quality control techniques. Most utility operators believe the principal threat to insulator life is the corrosion of the hardware.

The threat promises to become more serious for two reasons:

1) Air-borne contamination is increasing. Today more than 10,000 communities have air contamination problems which are requiring aid from the U. S. Public Health Service.

2) Transmission voltages are going up. As voltages increase there will be higher electrical stress on insulator pins. Corona will be more likely to occur. Ozone will be generated and ozone greatly accelerates the corrosion process.

The type of corrosion that induces insulator cracking often takes the form of small, unnoticed deposits within the cement line, like those in the photograph. Fortunately, the Futura insulator design has proved its immunity to this form of corrosion damage. Turn the page to see what happens.

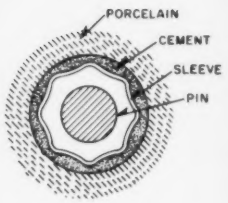


Corona on a heavily contaminated 115-kv line. Corona generates ozone which accelerates corrosion. As voltages go up and electrical stress increases, the danger of corrosion damage increases.

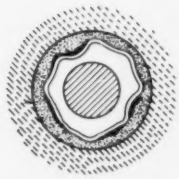
What cracks the Insulator?

A principal form of corrosion which induces porcelain cracking results from action of an oxygen concentration cell. Moisture and oxygen start the action which is speeded up by contamination and greatly accelerated by ozone which is a product of corona.

The surface of the cemented joint at the pinhole is especially suited to oxygen concentration cell corrosion. Products of corrosion form on the pin - - above the cement line, often unobserved. These corrosion products have a volume as much as 50 per cent greater than the original material. As they grow - - confined between the pin and the cement - - they exert a strong bursting force on the porcelain. Corrosion progressively destroys the thermal relief devices built in by the manufacturer. A surprisingly small amount of corrosion will cause damage.



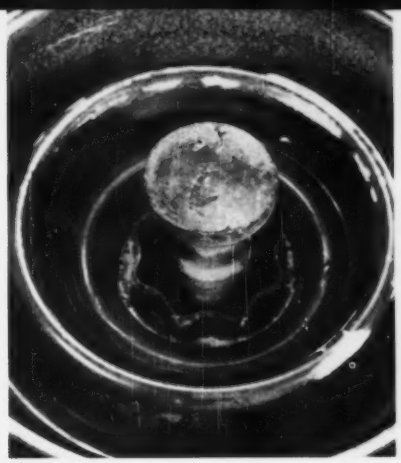
NORMAL WITH SLEEVE



CORROSION FORCES SLEEVE TOWARD PIN, PREVENTS CRACKING PORCELAIN.

Futura Pin Intercepts corrosion

The Corrosion Intercepting Sleeve (CIS) in the Futura insulator isolates the critical area of the insulator pin from the corrosive action. It permits corrosion to develop, but between the sleeve and the cement rather than on the pin. The bursting stress is relieved by the collapsing of the sleeve which has purposely been made relatively weak to protect the porcelain.



Futura insulator prototype served 15 years without damage at same location where conventional insulator cracked in six years.

FUTURA

Proved in 15 years of service

Excessive insulator contamination in coastal areas brought early recognition to the cause of insulator cracking from corrosion. It made it imperative to find ways of relieving corrosion stresses in contaminated areas. With contamination no longer restricted to coastal regions and with voltages rising, the lines of the future will also require corrosion protection.

The protection provided by the Corrosion Intercepting Sleeve is not a laboratory theory. It has been proved workable in 15 years of service under severely contaminated conditions in the Los Angeles area. The Futura prototype has worked successfully at the exact locations where standard insulators failed.

Intercepting sleeve insulators have been observed carefully for 15 years. Not one has failed in service. Samples have been removed from the line at five-year intervals and given the full range of manufacturing and design tests. Every one has passed 100 per cent. There is every reason to believe they could continue to serve for many more years.

Ohio Brass

HOLAR

FUTURA

vital protection for transmission lines

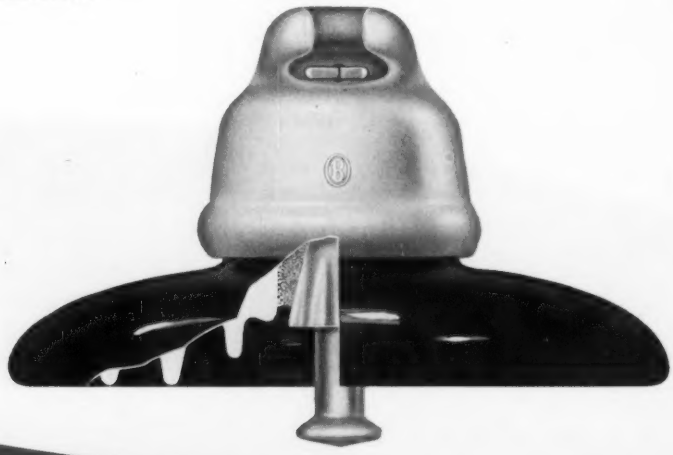
Who can predict where corrosion protection will be needed? Insulator life is normally accepted as at least 30 to 40 years. But corrosion damage could reduce that to five years or less. When protection is available at no extra cost, doesn't it make sense to use it? And since the Futura sleeve is needed for high voltage service, why not standardize on one unit for all services above 34.5 kv?

All the suspension insulators in the Futura series — 18,000, 25,000 and 36,000 pound M. & E. ratings — come with the Corrosion Intercepting Sleeve.

FUTURA anticipates industry demands

Rather than await industry demand for a new suspension insulator design, Futura anticipates it. Not only will the Futura design protect against corrosion problems of the future, it also provides high strength with less weight and without any increase in dimension.

You will be hearing more about Futura, its characteristics and its all-around suitability for the transmission lines of tomorrow.

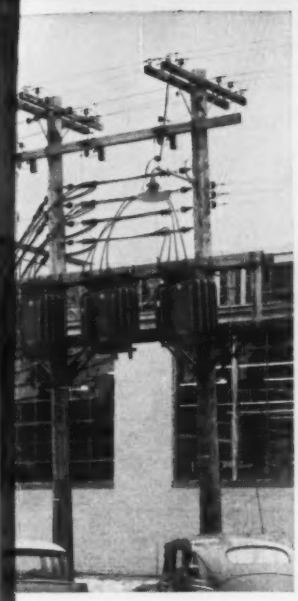


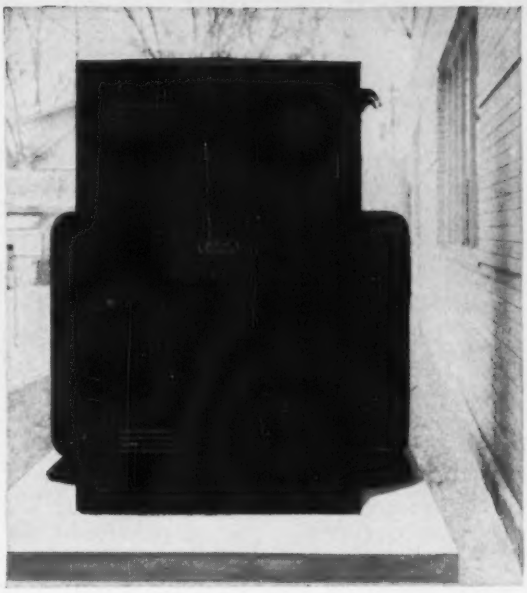
Ohio Brass

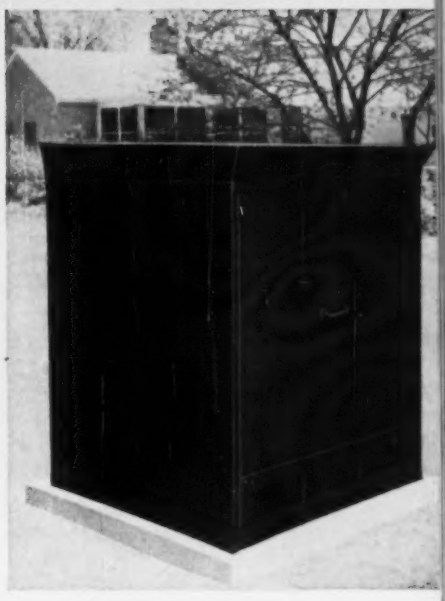
HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

rom THIS.....to THIS.....or THIS!







APPEARANCE is one important reason for going from overhead to underground construction. Today, the utilities working with Line Material have equipment available such as this L-M 12 kv, 300 kva, three-phase Pad-Mount transformer to replace the older-style pole-mounted bank.

ANOTHER SOLUTION to unsightly overhead banking is the Line Material Transclosure. Originally designed for either standard single or three-phase, pole-type distribution transformers, it can also be used singly or ganged to provide as much space as is needed for switching and protective devices.

New Developments Continue L-M Leadership in Underground Distribution Equipment

L-M Engineers continue development of new products to help utilities find the most practical, economical solutions to the growing pressures for underground distribution.

By R. C. KIRK, Vice President
Research and Engineering, Line Material Industries

As utility men know, there are growing pressures in many areas, to install distribution lines underground. These pressures come from the public, from subdividers and builders, and from communities.

New L-M Developments Help Cut Cost

Recognizing that these pressures are continually increasing, Line Material over three years ago, began working with utilities to produce equipment that would economically and practically solve this problem. The result is additional equipment from L-M which offers substantial reductions in underground distribution system costs, namely:

1 The Pad-Mount Transformer—a distribution transformer with a self-contained enclosure for terminals, switching and protective equipment that can be mounted on a ground-level pad or on a rooftop.

2 The Transclosure—a ventilated steel enclosure, also mounted on a ground-level pad, for pole-type distribution transformers, protective and switching equipment, load transfer equipment; can also accommodate service meters and telephone equipment.

3 The Power Pedestal—a stake-mounted pedestal for above-ground connection and termination of underground secondary services and secondary mains.

Underground Distribution Headquarters

Because of our extensive work in this field we logically consider Line Material as "Underground Distribution Headquarters." We would be happy to share our knowledge with you and would appreciate the opportunity of showing how our products can provide a practical and economical solution to your underground problems. Contact your L-M Field Engineer, or write me direct at Line Material Industries, Milwaukee 1, Wisconsin.

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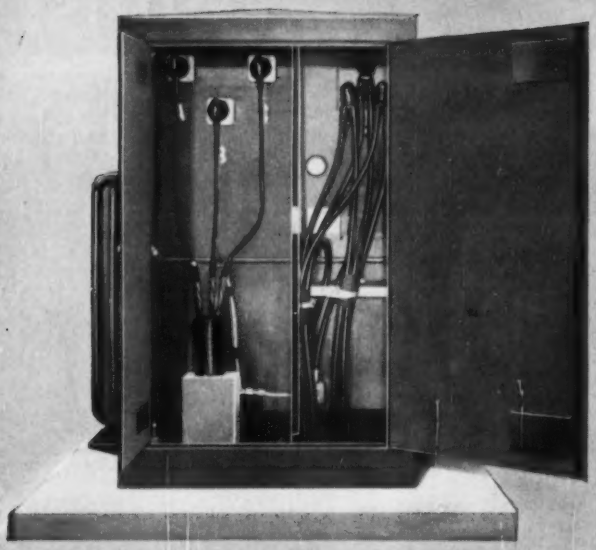
Underground Distribution Headquarters

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

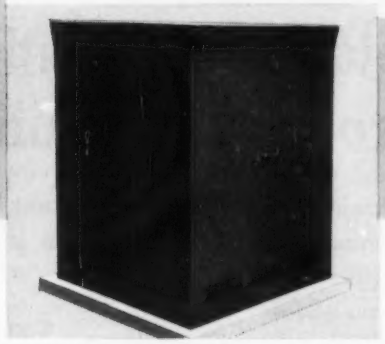


THIS 300 kva, 12,000 volt three-phase unit is installed at a small industrial plant. Note that the primary compartment at left can be closed for safety when work is being done on the secondary.

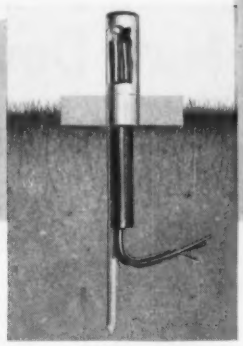
LINEMAN is about to close and lock door. Note the neat, compact appearance of the unit, which makes it ideal for residential subdivisions, where low shrubbery can hide the unit completely.

SINGLE PHASE 50 kva, 12,470 grounded Y/7200-volt L-M Pad-Mount Transformer. Primary compartment is closed, at left. At right is secondary compartment, with insulating barrier separating it from primary section.

OTHER NEW L-M UNDERGROUND DISTRIBUTION EQUIPMENT



L-M TRANSCLOSURE(TM), a convenient, multi-size, rainproof, ventilated steel housing for pole-type distribution transformers, protective equipment, reclosers, load transfer equipment, etc. Provides above-ground accessibility for underground services.



L-M POWER PEDESTAL, for above-ground connections of buried secondary services. Removable dome; raintight; tamperproof, with provision for padlock. Ask L-M Field Engineer or write for bulletin on styles available.

THIS TRUCKLOAD of L-M Pad-Mount Transformers is part of a 68-unit order being installed at a large trailer court in the Middle West. Quantity production and delivery like this have enabled L-M to make drastic reductions in the cost of this specialized, highly efficient transformer.

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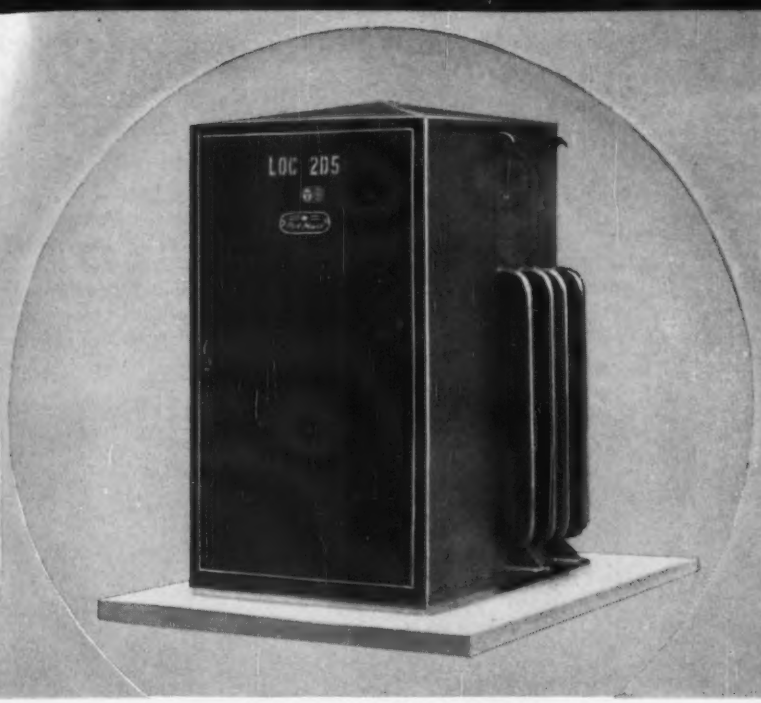
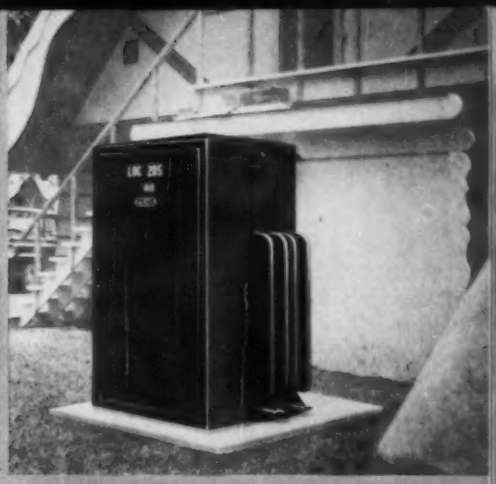
Nothing Else Like It!

The L-M Pad-Mount Transformer is available in single-phase through 167 kva, and three-phase through 500 kva in all distribution voltages.

Get complete information on how the LM Pad-Mount Transformer will help you simplify *your* underground construction problems. Ask the L-M Field Engineer for Bulletin DT8. Or write me at Line Material Industries, Milwaukee 1, Wisconsin.





L-M 225 kva three-phase Pad-Mount transformer provides underground service for Santa's Village, a "kiddie park" near Dundee, Illinois. Note that welded panels between cooling tubes and tank prevent attaching guys and ropes. This identical cabinet also accommodates a 500 kva Pad-Mount transformer for future load growth.

New L-M Pad-Mount Transformers Are Practical For Underground Distribution

Developed by L-M in cooperation with engineers of major utilities to meet specific requirements for underground distribution systems. Provide advantages not available in other types.

By **A. R. WAEHNER**
Director of Transformer Sales
Line Material Industries

Economical underground distribution is a vital topic of study and discussion today by leading system-planning engineers. Recognizing the future developments, load-growth opportunities, and other factors placing pressure on utilities, Line Material has cooperated with utilities to develop equipment that will help make underground distribution simpler, more efficient, and more economical to install and maintain.

L-M's Outstanding Development . . . One of the leading developments from this extensive cooperative research is the Line Material Pad-Mount Transformer. This outstanding unit has already been thoroughly tested. It is used by a number of utilities, including one of the largest in the country, where it has been in operation for about two years. It is proving highly successful, primarily because the design has been progressively developed to take full advantage of the opportunities afforded by newer, simpler methods of underground construction.

Conventional or Self-Protected . . . The L-M Pad-Mount Transformer is of Round-Wound® design, available in either conventional or self-protected, in single- or three-phase, in a tank specially designed for ground-level or roof-top mounting. A locked door covers the primary and secondary bushings. It can be completely hot-stick operated. There is an oil switch in the primary. A stand-off insulator for primary leads, mounted in the cabinet but not on the transformer, permits taking the transformer out of service when desired.

Compartmental Design . . . The compartments are so arranged that the primary section is completely isolated with a barrier of insulating material. This prevents access to the primary when working the secondary side. Door has rust-proof stainless-steel piano hinge.

No De-Rating with This Unit . . . The de-rating conventionally applied to transformers in buried or semi-buried vaults is not necessary, because the L-M Pad-Mount is a free-standing, above-ground unit, which takes full advantage of air circulation.

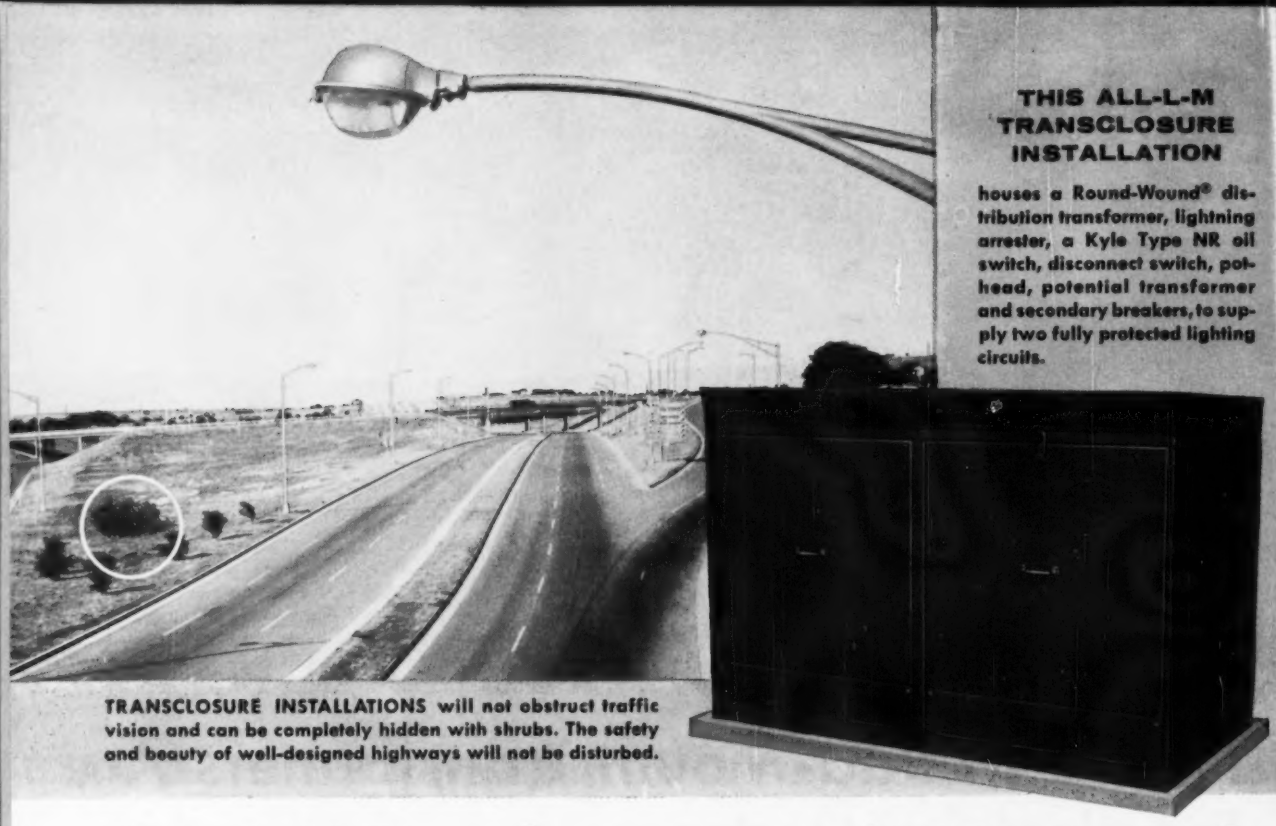
Volume Results in Cost Reduction . . . The original cost of this highly specialized, highly efficient unit apparently would be much more than even the most refined of the buried devices. However, volume production has enabled L-M to make drastic cost reductions. The L-M Pad-Mount is an extremely economical unit to buy and install in comparison with other systems.

Easy to Install . . . Installation is extremely simple. All that is needed is a concrete pad, with primary and secondary services brought up through fibre conduit. The bushings are so located that no sharp bends are made in the cable, thus assuring full life for the cable.

The cabinet may be separately shipped, mounted, and wired when underground services are installed in a subdivision. The transformer may be shipped later and easily attached to the compartment with four bolts.

LINE MATERIAL® Industries
McGRAW-EDISON COMPANY
McGRAW EDISON

Underground Distribution Equipment



THIS ALL-L-M TRANSCLOSURE INSTALLATION

houses a Round-Wound® distribution transformer, lightning arrester, a Kyle Type NR oil switch, disconnect switch, pothead, potential transformer and secondary breakers, to supply two fully protected lighting circuits.

TRANSCLOSURE INSTALLATIONS will not obstruct traffic vision and can be completely hidden with shrubs. The safety and beauty of well-designed highways will not be disturbed.

New L-M Transclosures Save $1,750 On Each Highway Lighting Transformer Installation

New enclosure with modular construction offers savings in cost, erection time and space; permits transformer installations at the load center.

by C. W. PETERSEN, Product Manager
Line Construction Materials
Line Material Industries

Costs of expressway and highway lighting can be greatly reduced by use of the new L-M Transclosure(TM) for all transformer installations. The Transclosure will house a standard oil-filled transformer, lightning arrester, oil switch, disconnect switch, pothead, secondary breakers and potential transformer. Using the Transclosure instead of the conventional concrete block or brick housing offers an estimated saving of $1,750 per transformer installation. On a projected 60 miles of highway, where 100 to 125 installations are expected, a total saving of from $175,000 to $218,000 is anticipated.

Basically the Transclosure is a weatherproof enclosure, fabricated of heavy-gauge steel, to be mounted on a concrete pad. It houses the transformer and associated equipment. It provides ample ventilation for the transformer by means of vents at top and bottom, with baffles to prohibit entrance of all foreign objects, including wildlife. Removable primary and secondary doors can be padlocked to prevent unauthorized personnel from entering, yet they provide complete and easy access to the equipment.

Interlocking design assures a weatherproof housing; the sloped roof sheds rain. Modular construction permits ganging the units to provide whatever space is required. Units may also be expanded vertically by installation of larger side panels and bottom vents. Transclosures are available in three sizes, to accommodate transformers up to 100 kva. Small in size and light in weight, they are designed to be assembled at the job site. A complete installation, including transformer and associated equipment, has been installed with less than two man-days of labor.

The clean, low lines produce a silhouette that does not detract from highway beauty or obstruct traffic vision. Low shrubs will hide the entire installation completely. Transclosures may be installed precisely at the lighting load center, eliminating all overhead construction and producing the shortest and most economical secondary runs.

Get Complete Information

These are just a few of the reasons why many engineers are specifying this new approach to inexpensive highway lighting. For complete details, contact your L-M Field Engineer or Lighting Engineer or write me direct at Line Material Industries, Milwaukee 1, Wisconsin. 407

LINE MATERIAL® Industries *Transclosures*

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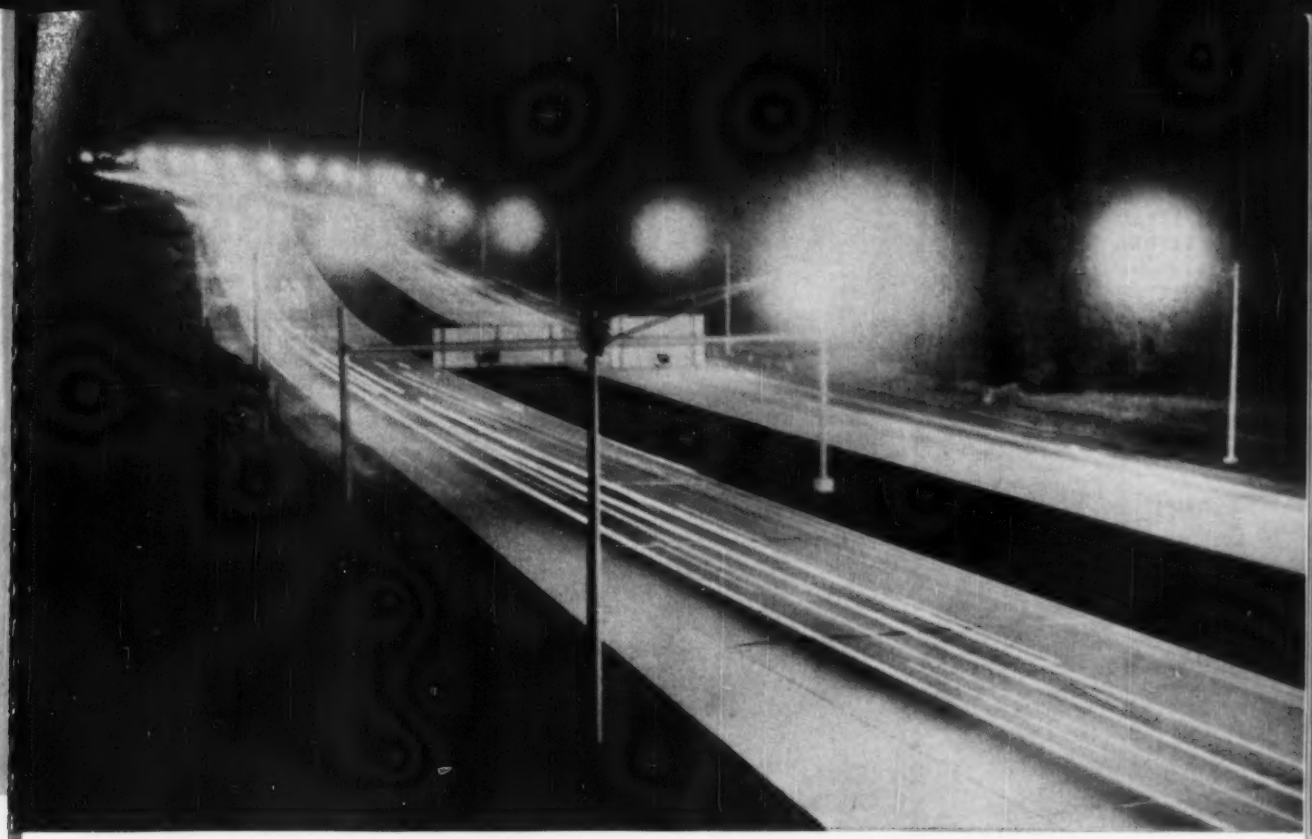
McGRAW EDISON



NIGHT VIEW of Darien-Stamford section of the Connecticut Turnpike, with L-M fluorescent luminaires supplying the illumination.

The Connecticut state highway department has made this turnpike an outstanding example of modern highway design and lighting.

New L-M Fluorescent Luminaires Make Connecticut Turnpike Brighter, Safer

An outstanding example of modern highway design is the Connecticut Turnpike, a 130-mile ribbon across the state from New York to the Rhode Island line. Both in design and lighting, safety was a principal consideration, according to Newman E. Argraves, State Highway Commissioner.

The most heavily traveled sections of the highway are lighted for safer night driving. Line Material fluorescent luminaires were selected for the Darien-Stamford section because of their excellent appearance and the efficiency of the reflector design, which appealed to the state highway department engineers.

Line Material, a pioneer and leader in outdoor lighting, offers a full line of equipment—fluorescent, mercury vapor, incandescent lighting, and all accessories and apparatus. L-M's lighting application engineering is an outstanding service.

What's YOUR Lighting Problem?

Tell us your lighting problem. L-M Lighting Engineers will help you solve it—whether it's a highway, a neighborhood street, an airport, a shopping center, a farmyard or a railroad yard. Ask the L-M Field Engineer for bulletins and information; or write Lighting Division, Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

DAYTIME VIEW of the Connecticut Turnpike shows the deep-type 6-foot L-M fluorescent luminaire. Mounting height is 26 to 28½ feet, on 6- to 12-foot brackets, with light centers 30 feet above the highway grade.

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Outdoor Lighting

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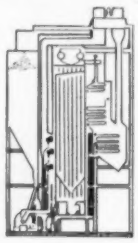
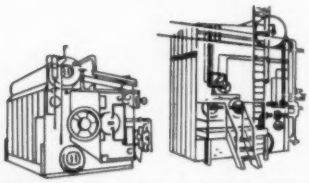
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

Power Plant Products

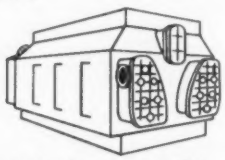
HEAT ENGINEERED BY FW

LARGE STEAM GENERATORS
Designed to meet all requirements for Central Station or Industrial power plants, in single- or twin-furnace designs, with or without reheat or dual circulation.



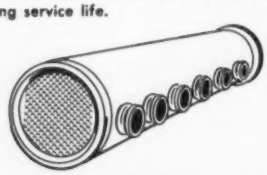


PACKAGED and FIELD-ERECTED BOILERS—Compact, economical, standardized units in capacities from 10,000 to 450,000 lb/hr, oil, gas or pulverized coal fired.

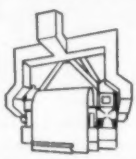


CONDENSERS and HEATERS—Condensers of single or two-pass, double or counter-flow designs. All-welded high and low pressure feed-water heaters.

COOLING TOWERS—Induced draft counter flow towers of all-redwood construction for maximum dependability and long service life.



NUCLEAR COMPONENTS—Heat exchangers, steam generators, pressurizers, reactor vessels, separately-fired superheaters for stationary and marine power plants.



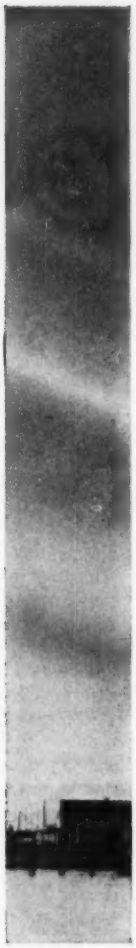
PULVERIZED FUEL SYSTEMS—Completely engineered systems utilizing FW ball mill or MB planetary roll and table pulverizers.

HEAT ENGINEERING

WORLD'S FIRST

NATURAL CIRCULATION

321,500 kw Unit No. 3 at Detroit Edison's River Rouge Power Plant is served by a Foster Wheeler Reheat Steam Generator —one of the most efficient ever built



One of the largest steam generators ever built, this unit was heat engineered by Foster Wheeler to meet the most exacting plant requirements. It supplies Detroit Edison's River Rouge Unit #3 with *two million* pounds of steam per hour at 2450 psi and 1050 F at the superheater outlet. The steam is reheated to 1000 F after it has passed through the initial stages of the turbine.

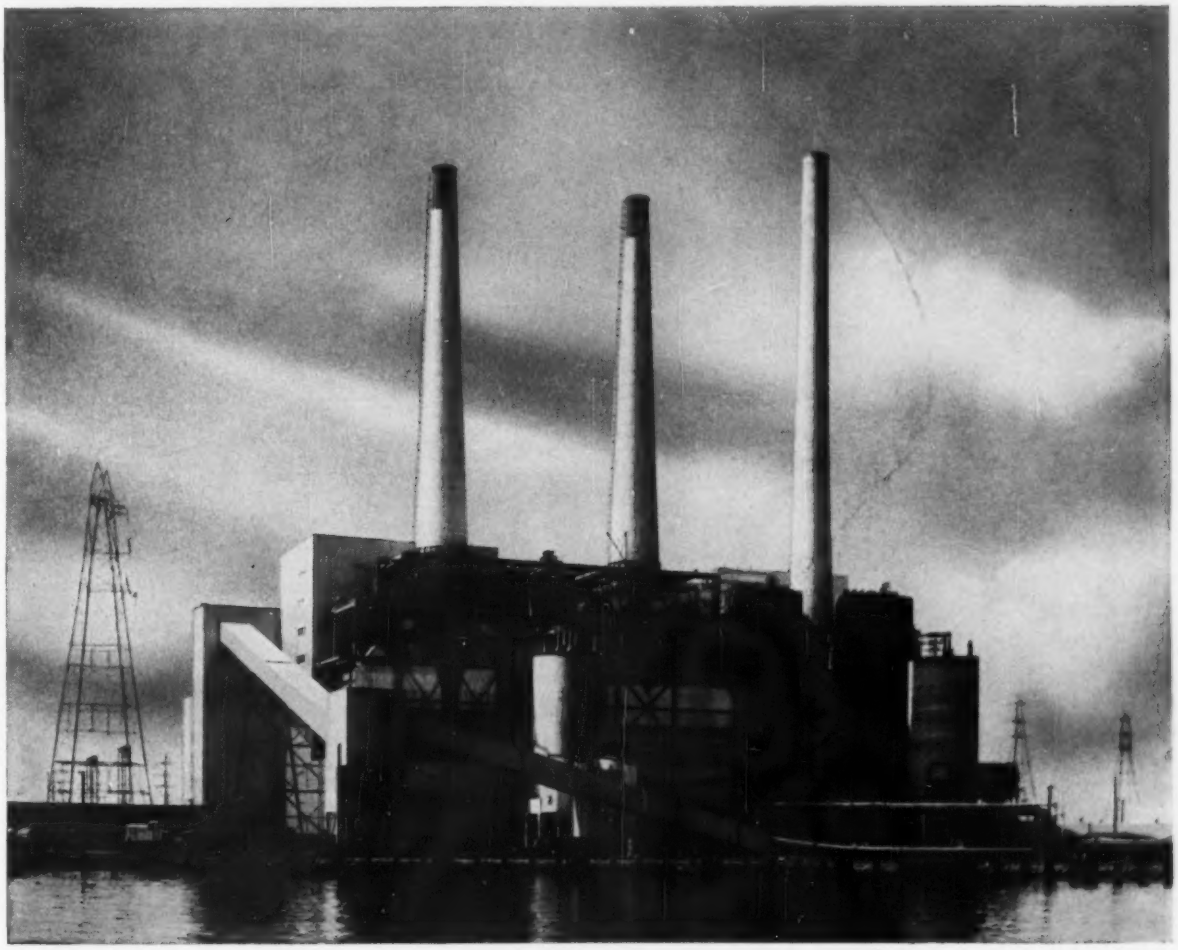
Size alone is not the only measure of this installation. The FW steam generator also helps make Unit #3, with a heat rate of 8685 Btu per kwhr, one of the most economical and efficient ever built, producing a kilowatt hour of electricity from less than ¾ lb of coal.

With more than a half century of specialized experience in heat engineering and steam generation, Foster Wheeler will welcome the opportunity to quote on your steam plant units—for any pressure or any capacity. Foster Wheeler Corporation, 666 Fifth Ave., New York 19, N.Y.

by Foster Wheeler creates

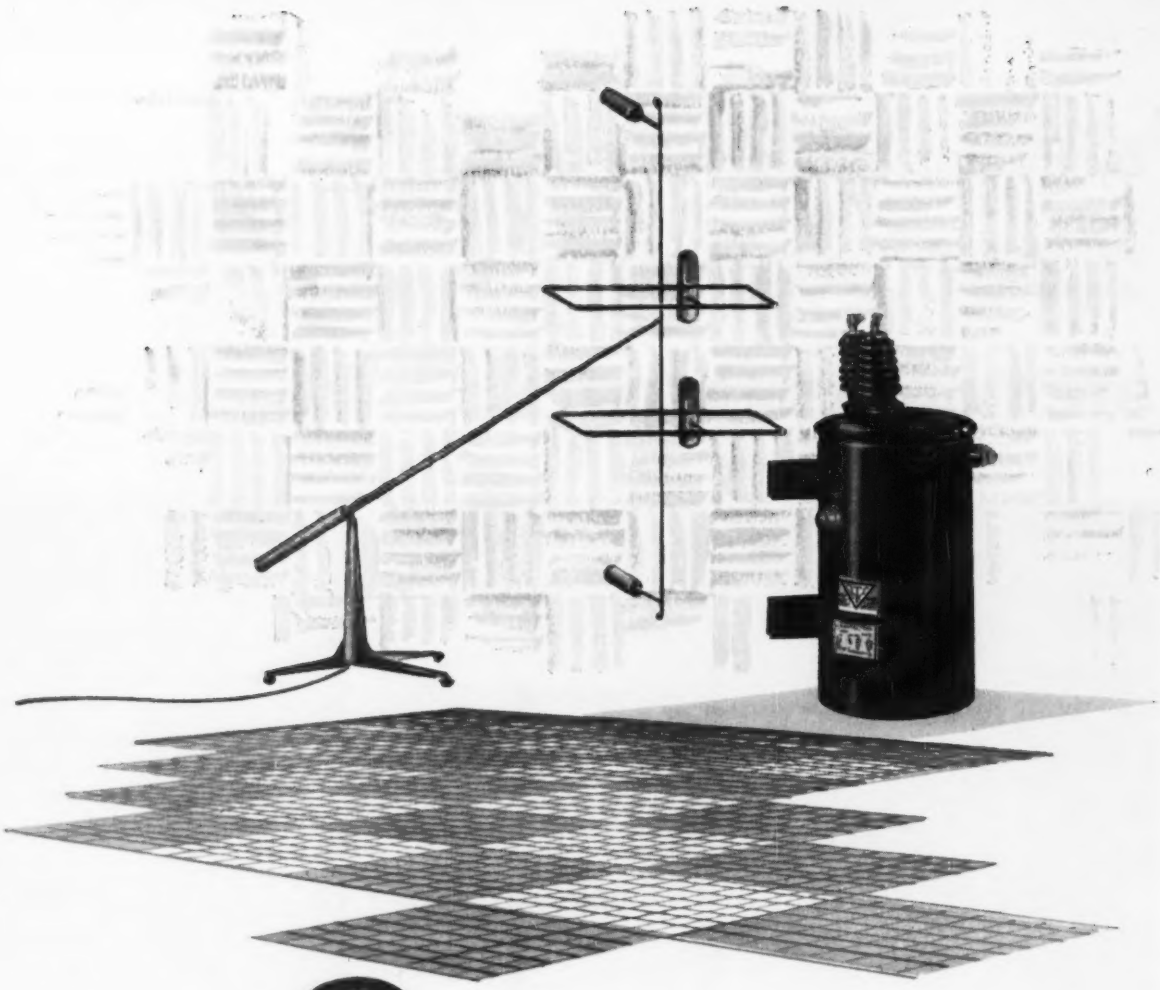
2,000,000 lb/hr

STEAM GENERATOR



FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.



QUIET transformers assure satisfied customers.

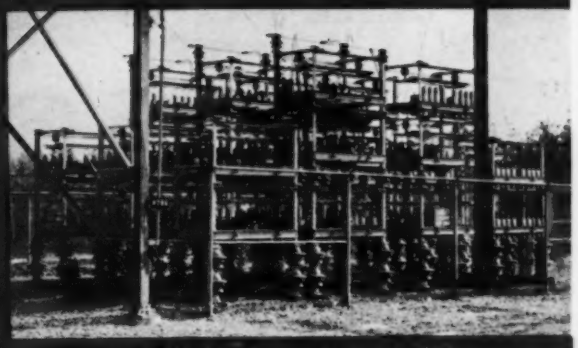
More-than-ordinary quietness is another outstanding feature of RT&E transformers. Normal noise is hushed, for full transformer life, by a unique core-clamping method that isolates the core and minimizes the transmission of sound vibration to the tank. By this method, operating noise is reduced to a point far below maximum db levels being considered by NEMA as standard for distribution transformers.

More proof that you buy more than just another transformer when you buy from RT&E.

RT&E CORPORATION

WAUKESHA, WISCONSIN
PORTLAND, OREGON

FF



Thirty 375 KVAR "Varblock" assemblies, each containing fifteen 25 KVAR, single-phase, 7620-volt TEMPALL power capacitors. These assemblies are part of a 11,250 KVAR, 3-phase, 69 KV capacitor installation.

creative engineering in action

TOBE DEUTSCHMANN TEMPALL CAPACITORS...Tobe creative capacitors—it takes specific problems. And Tobe solutions are often outstanding examples of capacitor engineering through which essential industry benefits.

Consider for example, the problem engineers faced in the building of a substation which is practically in the Atlantic Ocean. Capacitors at this installation are subject to the corrosive attacks of salt water, sun and sand. But Tobe capacitors, with such features as stainless steel cases, self-locking neoprene terminal caps, and vibration proof concave washers on the hardware, stand up to the elements. They take a beating and keep on working because they are created to last.

This "creative engineering in action" is yours to call upon, whether you need capacitors for power-factor correction or for the generation of a shock wave in a "hot-shot" wind tunnel. Talk to Tobe today. TOBE DEUTSCHMANN CORPORATION, Norwood, Massachusetts.

TOBE 25 KVAR POWER CAPACITOR

TOBE

TEMPALL CAPACITORS

Since 1913, pacesetter research, trustworthy engineering, [illegible]

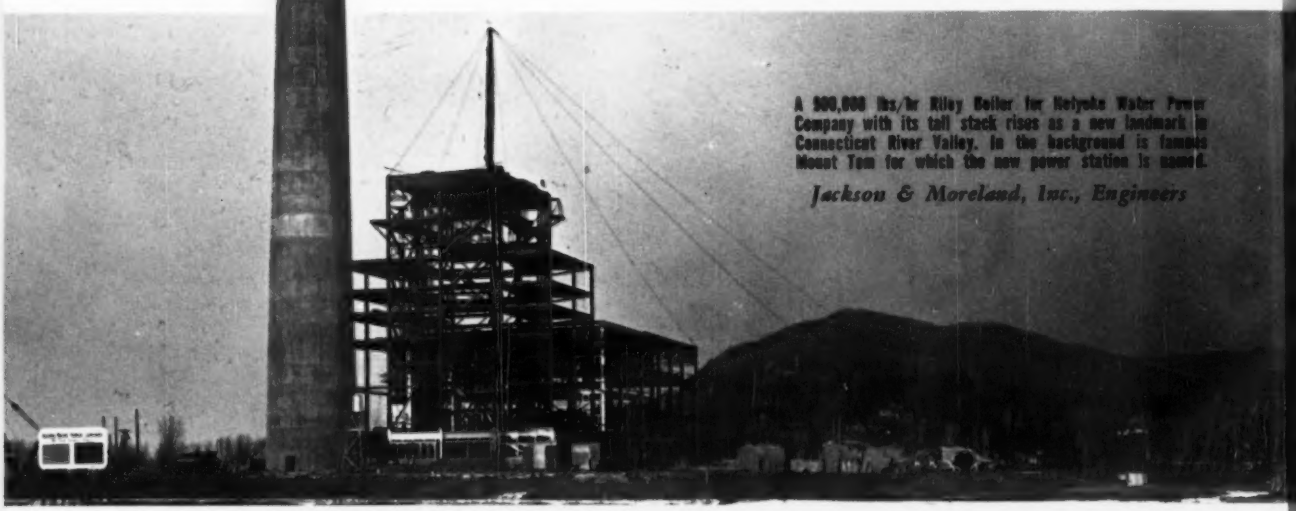
RILEY CENTRAL STATION UNITS

Landmarks From Coast to Coast

A decade of growth of the electric power industry and of Riley Stoker Corporation, one of America's leading suppliers of steam generating and fuel burning equipment, is symbolized in these Central Station installations and customers — representing a few of the many Riley Central Station Boilers that have been installed in this period of great expansion.

Now, a new era of growth is here. New Riley boiler designs and fuel burning techniques will provide the high degree of dependability and efficiency required.

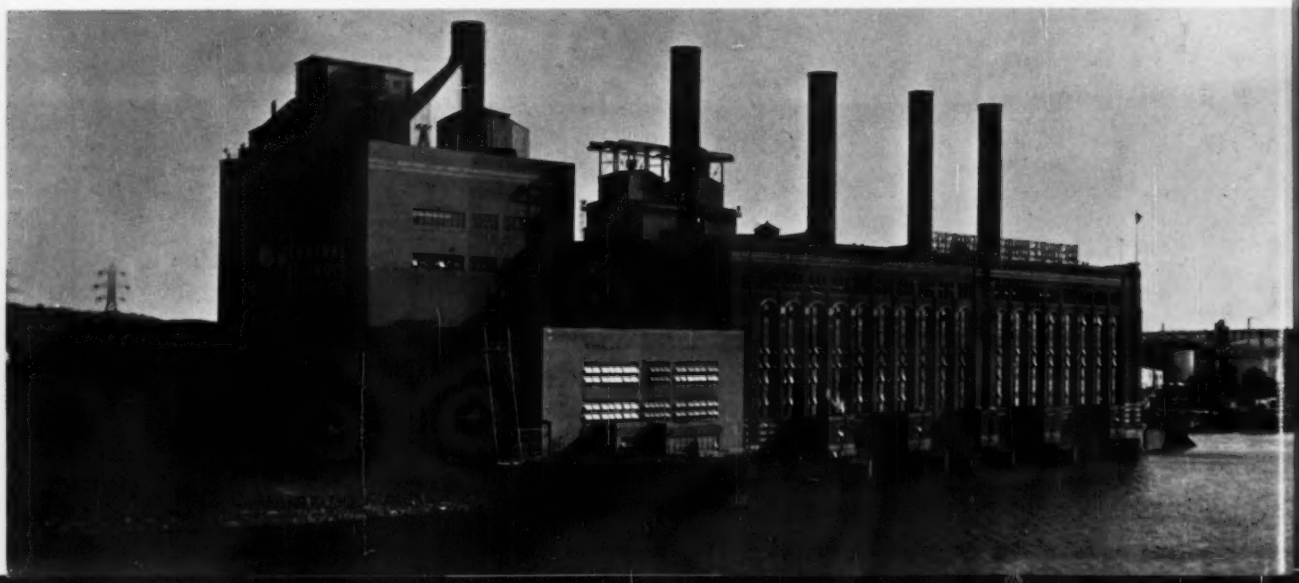
For details on the latest Riley developments consult your Riley representative.



A 900,000 lbs/hr Riley Boiler for Holyoke Water Power Company with its tall stack rises as a new landmark in Connecticut River Valley. In the background is famous Mount Tom for which the new power station is named.

Jackson & Moreland, Inc., Engineers

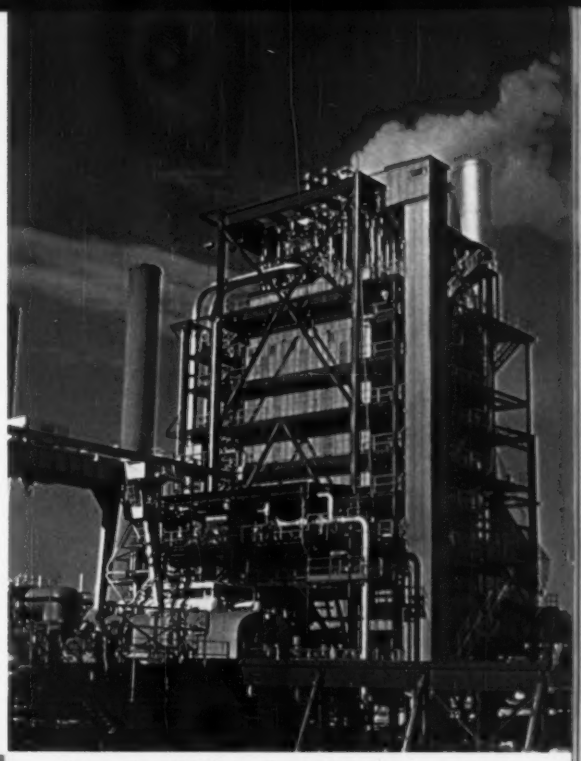
Below — Central Illinois Light Company's R. S. Wallace Station has had Riley Units installed since 1939. The latest is a 690,000 lb/hr Riley Reheat Unit. Another Riley 825,000 lb/hr Unit is being installed at LaMarsh Station. *Commonwealth Associates, Inc., Engineers.*



A Few of the Many Public Utility Companies That Are Using Riley Steam Generating Equipment

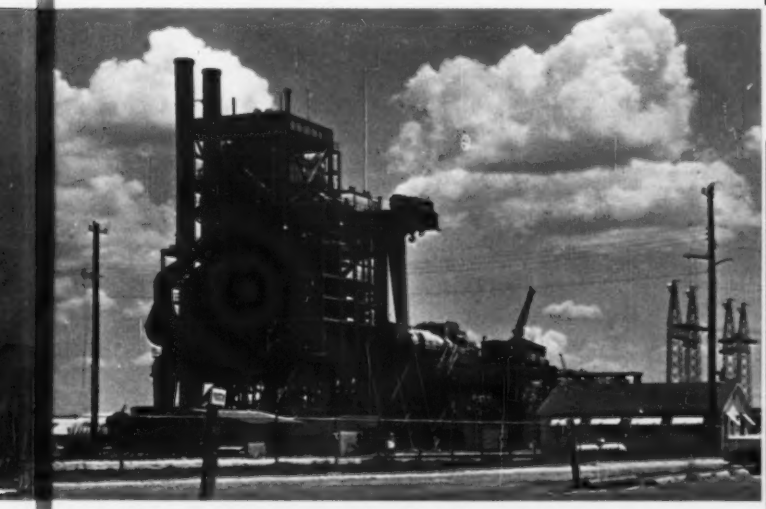
Houston Lighting & Power Co.
New Orleans Public Service Co.
Monongahela Power Company
Southwestern Gas & Electric Co.
Public Service Co. of Indiana, Inc.
Columbus & Southern Ohio Electric Co.
South Carolina Electric & Gas Co.
Northern Virginia Power Co.
Southwestern Public Service Co.
Union Electric Co. of Illinois
Taiwan Power Co. (Formosa)
Iowa-Illinois Gas & Electric Co.
Montana-Dakota Utilities Co.
Delaware Power & Light Co.
Minnesota Power & Light Co.
Central Louisiana Electric Co.
The Hartford Electric Light Co.
Manila Electric Company
Union Electric Co. of Mo.
Ohio Edison Company
Public Service Electric & Gas Co.
Dallas Power & Light Co.
Texas Electric Service Co.
Louisiana Power & Light Co.
Potomac Edison Co.
West Penn Power Co.
Arkansas Power & Light Co.
Utah Power & Light Co.
Florida Power Corporation
Florida Power & Light Co.
Central Illinois Light Co.
Southern Nevada Power Co.
Northern States Power Co.
Commonwealth Edison Co.
Gulf Power Co.
Pennsylvania Electric Co.
Interstate Power Co.
Philadelphia Electric Corp.
Kansas Gas & Electric Co.
Pacific Gas & Electric Co.
Holyoke Water Power Co.
Mississippi Power Co.
Worcester County Electric Co.

A survey of your plant by qualified consulting engineers could show ways of making substantial savings in your power costs.

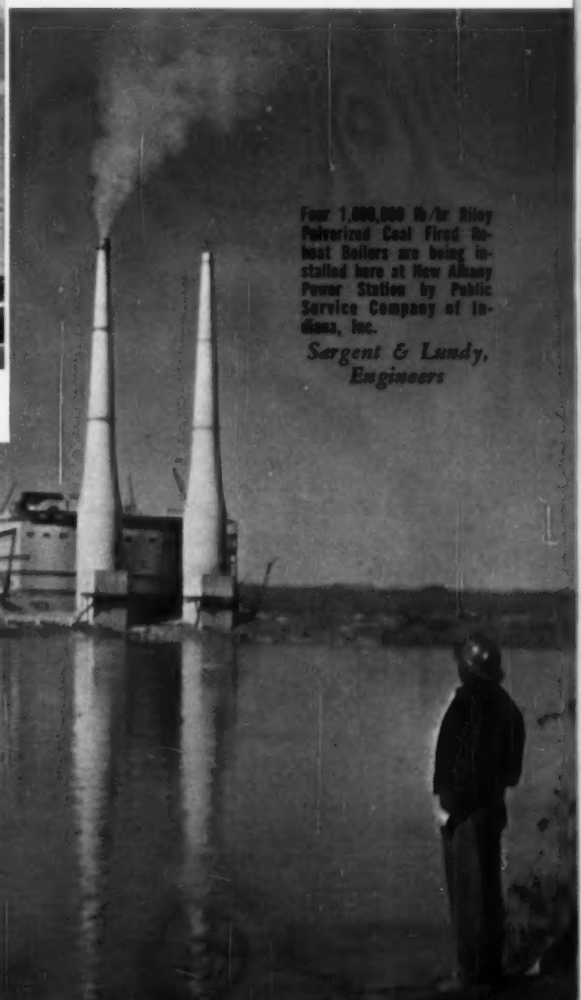


Above — The 870,000lb/hr Riley Turbo Furnace Unit at the Permian Basin Steam Electric Station of Texas Electric Service Co. which has two other Riley Units in its system.

Ebasco Services, Inc., Engineers



Houston Lighting and Power Company has installed twelve Riley Boilers in the past twenty years. Here is a recent installation at the North Houston Steam Electric Station.



Four 1,000,000 lb/hr Riley Pulverized Coal Fired Reheat Boilers are being installed here at New Albany Power Station by Public Service Company of Indiana, Inc.

Sargent & Lundy, Engineers

RILEY

STEAM GENERATING & FUEL BURNING EQUIPMENT

RILEY STOKER CORPORATION, WORCESTER, MASS.

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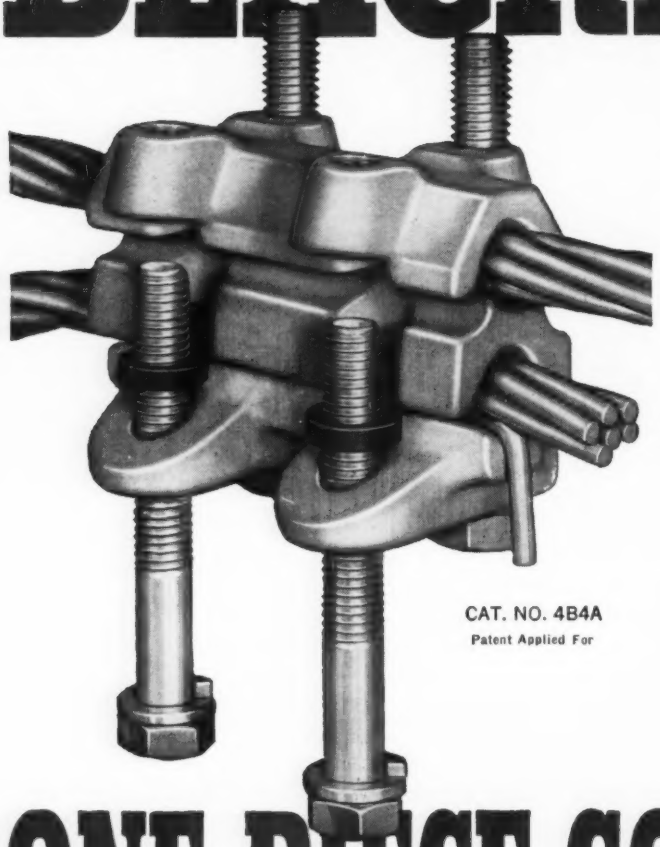
It's New! Installs quicker...easier

BLACKBURN



CAT. NO. 4B4A
Patent Applied For

It's here... a heavy duty one-piece 4-bolt connector with all the electrical and mechanical advantages of a U-bolt connector... yet much easier to install.

No bothersome nuts, washers, housings, spacer to take apart and assemble. Just three quick, easy steps and installation is completed.

Housings are of non-copper-bearing aluminum alloy. Spacer of soft aluminum pig protects conductor, aids conductivity. Spacer treated with heavy coating of oxide inhibiting compound. Hardware is high strength aluminum alloy completely alumilited to prevent seizing.

WIDE RANGE...
Accommodates conductors—2/0 to 397.5 ACSR—3/0 to 477 MCM.

ONE-PIECE CONNECTOR

HERE'S HOW EASY THE NEW 4-BOLT CONNECTOR IS TO INSTALL

Unscrew the two free bolts contained with neoprene washers and hang over main.

Insert tap wire.

Tighten and you have the ultimate in a good connection.

Available through electrical wholesalers everywhere

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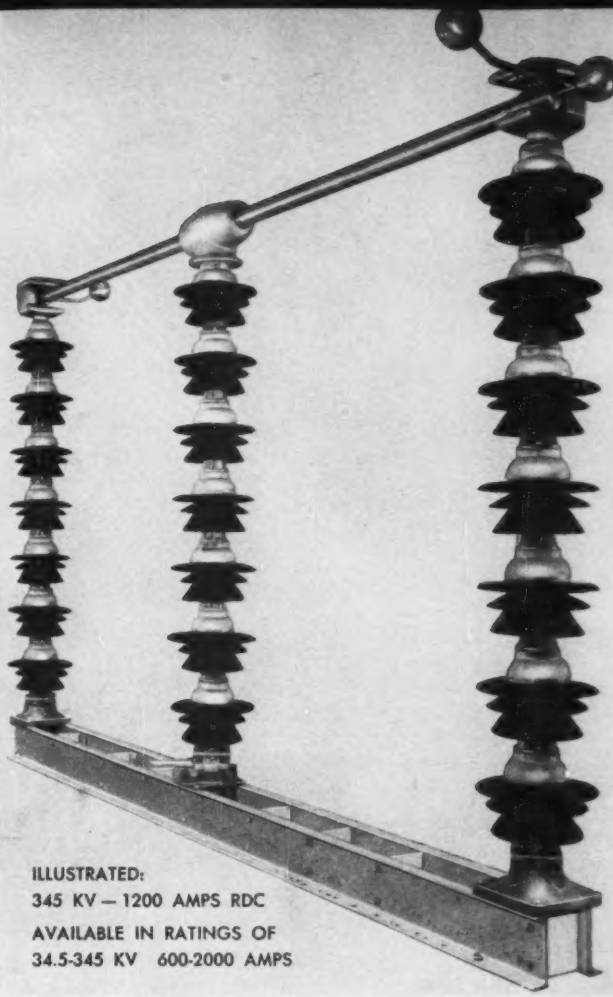
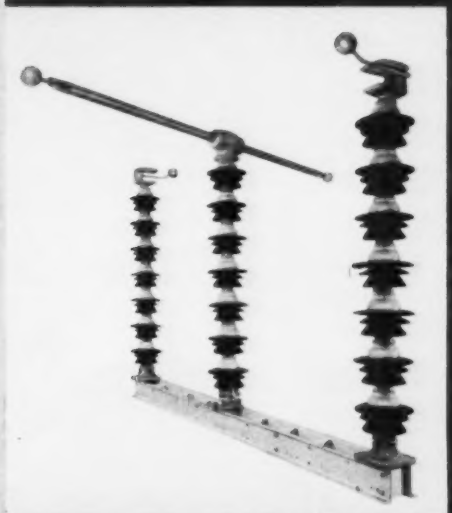
1525 WOODSON RD., ST. LOUIS 14, MO., WYdown 3-9430



ILLUSTRATED:
345 KV — 1200 AMPS RDC
AVAILABLE IN RATINGS OF
34.5-345 KV 600-2000 AMPS



For Appearance, Low RIV, and Ease of Operation Choose Southern States RDC Side-Break Switch

Certain design characteristics count heavily in the selection of air switches.

Appearance is important, especially where the switch is to be part of a modern substation. The RDC is streamlined. It has no exposed cranks, arms, or clevises to mar its smooth contours.

Radio Influence Voltage is a strong factor, especially where the switch is in an urban area. The RDC's corona-resistant lines result in RIV of less than 500 microvolts.

Ease of operation is always a prime consideration. The RDC, with the weight of the blade balanced on the center insulator, operates with ease in any mounting position.

Other important characteristics of the RDC, to be considered in judging an air switch, are: Amplitact® contacts to provide maximum dependability under short circuit stress . . . resistance of exposed metal parts to corrosion . . . one-piece blade balanced in all positions . . . simplified installation . . . and quality construction throughout.

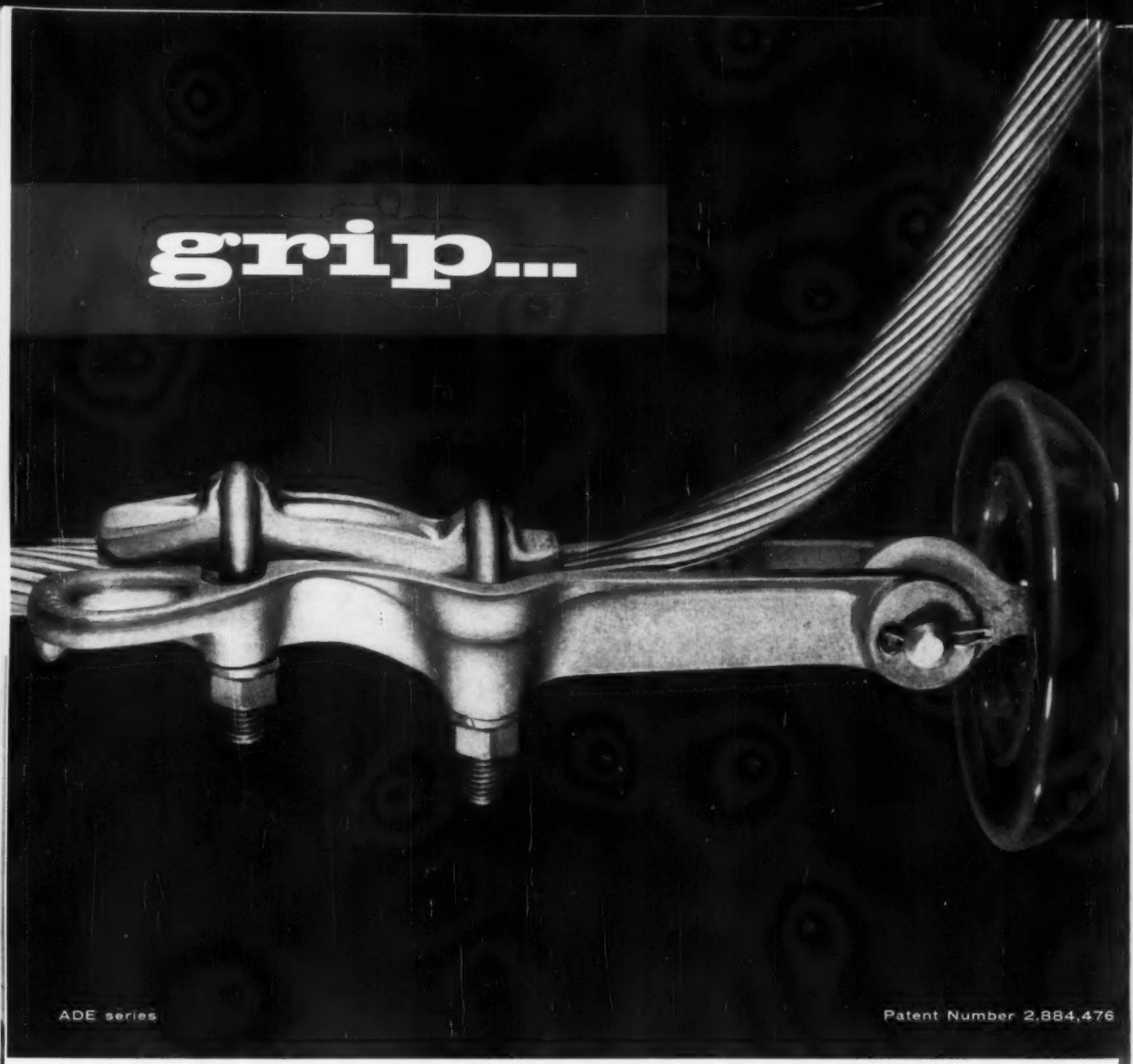
For complete details, see your Southern States representative, or write us direct for Technical Bulletin 58RDC.

LIVE BETTER ELECTRICALLY

IN CANADA:
Dominion Cutout Co., Ltd., Toronto

SS

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA



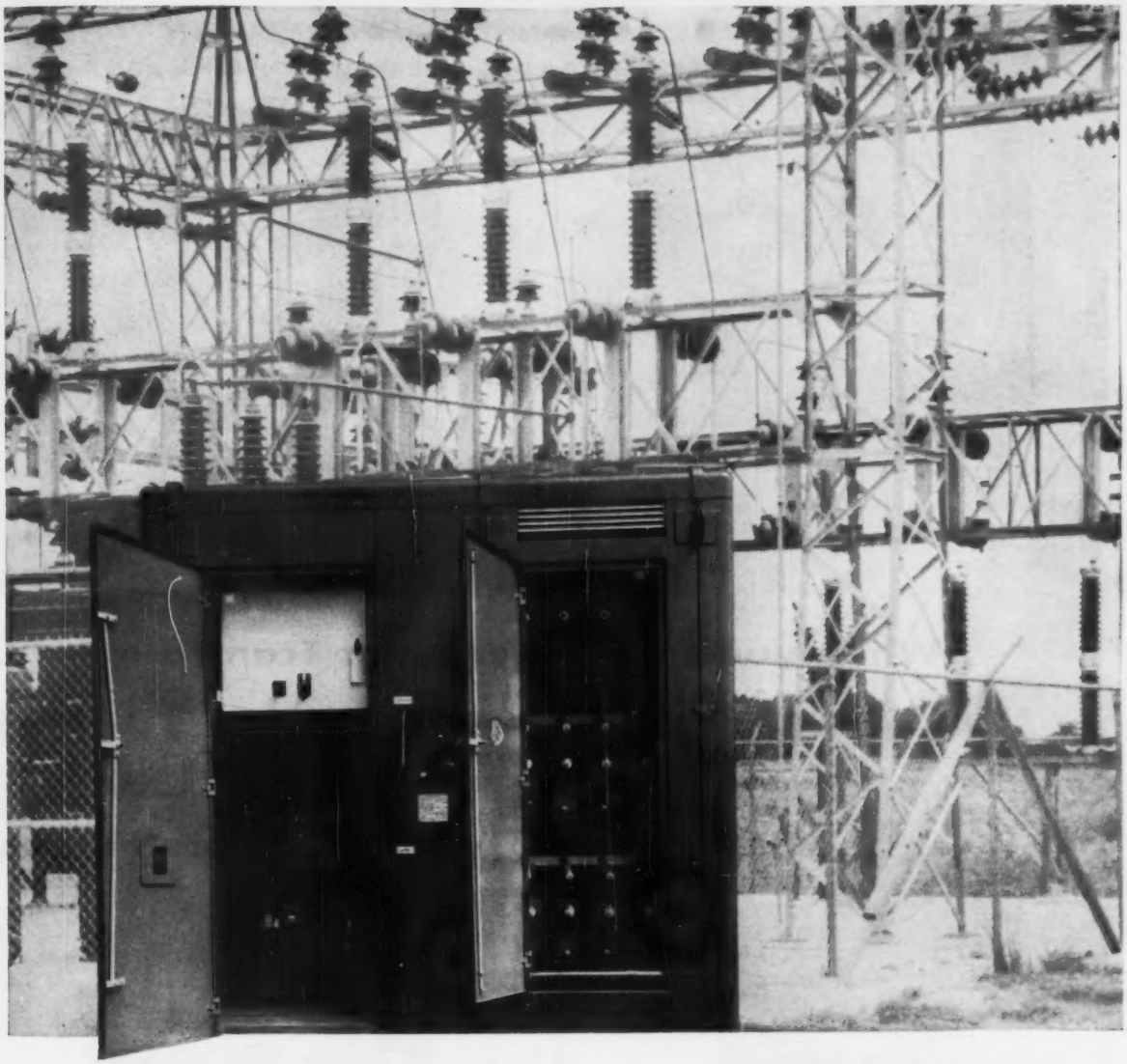
Anderson's exclusive Snub-Seat straight line clamp has higher holding power than comparable clamps. Built for trouble-free service, its unique "working" features facilitate hot line work and distribute pressure preventing cable damage.

ANDERSON ELECTRIC CORPORATION • BIRMINGHAM 1, ALABAMA
EXPORT REPRESENTATIVE: INTERNATIONAL STANDARD ELECTRIC CORP.
50 CHURCH STREET, NEW YORK 7, NEW YORK

ANDERSON ELECTRIC

Research / Quality / Performance / in Aluminum and Bronze Products

Aluminum and Bronze Power Connectors • Clamps • Fittings • Accessories for Substation • Transmission • Distribution • Undergrou



NEW FROM WESTINGHOUSE . . . **MOD-UL-VAR-50**

Prewired, Enclosed Capacitor Banks Cut Costs From Purchase Through Installation

The new Westinghouse Mod-ul-var-50 enclosed capacitor banks are shipped to you in one complete assembly with 50-kvar capacitors installed and wired. All that is necessary at the installation site is setting the equipment in place and connecting it to the line.

In Mod-ul-var-50 equipments, 50-kvar capacitor units are factory installed into 1200-kvar modules. The power entrance or switch compartment and the required number of modules for up to 6000-kvar total capacity are bolted together, wired and shipped to you in one complete assembly, or in sections, depending on your requirements at the installation site. The use of 50-kvar units and the method of manufacture save you man-hours in installation time and up to 16% in purchase price over conventional equipment using 25-kvar units.

Future expansion for additional capacity is as easy as removing the end compartment, adding factory-assembled modules, and replacing the end compartment.

Let us show you how Mod-ul-var-50 enclosed capacitor equipments can save you dollars in *lower initial cost, reduced installation time* and *ease of future expansion*. Call your Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60984

YOU CAN BE **SURE**...IF IT'S

Westinghouse

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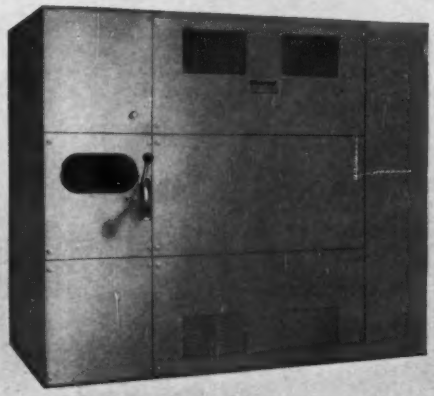
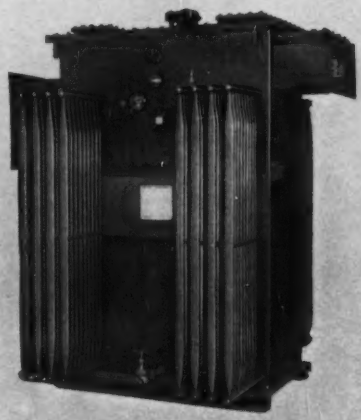
Wagner

UNIT SUBSTATION TRANSFORMERS

112½ to 2000 Kva—three phase, 60 cycles, 15 KV and below



VENTILATED DRY-TYPE—For indoor installation in reasonably dry, dust-free, well ventilated locations. Light in weight, ideal for multi-story buildings. No fire-proof vaults required. Insulated for 80°C temperature rise.

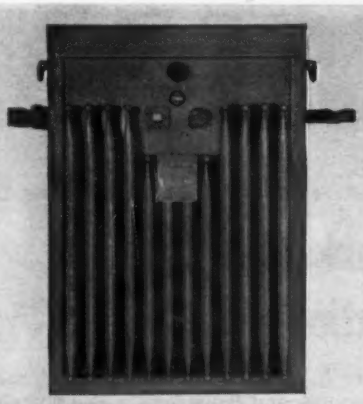


OIL-FILLED—Generally installed outdoors. Can be used indoors in fire-proof vaults. Outdoor transformers can be connected to indoor switchgear using weather-proof bus-duct. 55°C rise, self-cooled or forced-air cooled.

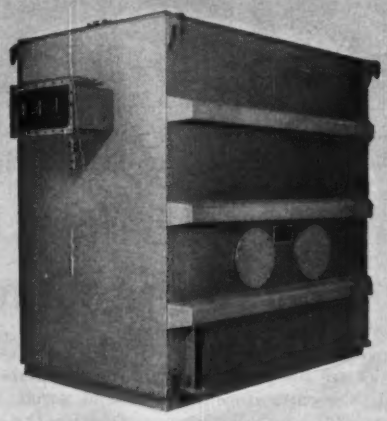
When you select a Wagner Transformer...

YOU GET THE TYPE FOR YOUR PLANT

PLUS... the assurance of continuous,



NOFLAMOL—Non-inflammable liquid filled. For indoor or outdoor installation, especially suited for chemical plants, refineries and similar locations where explosive liquids or gases are present. The close-coupled design illustrated fits flush against switchgear enclosures. Throat connected designs are also available. 55°C rise, self-cooled or forced-air cooled.



SEALED DRY-TYPE—Suitable for indoor or outdoor use, completely fire-proof, easy to clean and maintain. Sealed tank is filled with nitrogen under low pressure. Insulated for 150°C rise, self-cooled.

WAGNER ELECTRIC CORPORATION

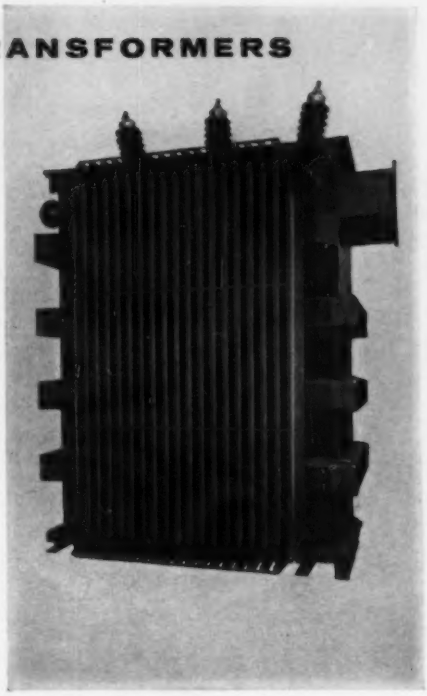
WT58-16

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

Wagner **INDUSTRIAL POWER TRANSFORMERS**

Oil-filled, through 10,000 Kva, 67 KV and below.

Noflamol, through 7,500 Kva, 15 KV and below.



BEST SUITED ELECTRICAL SYSTEM...

dependable service!

IF YOU are planning a new plant distribution system... modernizing your present one... or adding to its capacity to meet increasing demands for power... it will pay you to specify Wagner Transformers.

For your main plant substation, Wagner Liquid Filled Industrial Power Transformers are available in standardized ratings through 10,000 Kva.

For your load centers, Wagner can supply Unit Substation Transformers in any of the types shown at the left, furnished with suitable incoming line sections, to meet your particular requirements. These PREDESIGNED transformers will save you time and save you job engineering costs. You can specify the secondary switchgear you prefer.

For plant areas requiring 120/240 volts, single-phase or 208Y/120 volts three-phase, Wagner Dry-Type Distribution Transformers are an economical choice.

All Wagner Industrial Transformers are liberally designed, sturdily constructed, thoroughly tested and able to meet the heaviest industrial demands. They assure continuous, dependable power for years to come.

For expert advice on your present and future plant transformer needs, call or write the Wagner branch near you.

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Wagner **DRY-TYPE DISTRIBUTION TRANSFORMERS**

Single-phase 1 to 100 Kva—Three-phase 3 to 300 Kva—600 volts and below

Type AE, single-phase, 1 through 50 Kva, and Type AP, three-phase, 3 through 30 Kva, can be used for indoor or outdoor installation, larger ratings for indoor installations only. Ratings through 10 Kva single-phase and 30 Kva three-phase are designed for wall mounting, other ratings for floor or platform mountings.

Available for high voltages of 120 X 240, 240 X 480, 480 and 600 volts to 120/240 volts single-phase, and 480 and 600 volts to 208Y/120 volts three-phase.

USE SOUTHWIRE SINGLE SOURCE SERVICE

A quick glance at Southwire's list of products shows how you can save time, trouble, and money.

You'll find it a simple matter to deal with one source—one order, one bill, one check. And when you order from Southwire, you get Southwire service—the extra that means so much, but costs no more.

A phone call right now will bring our catalog, prices, delivery schedules to your desk.

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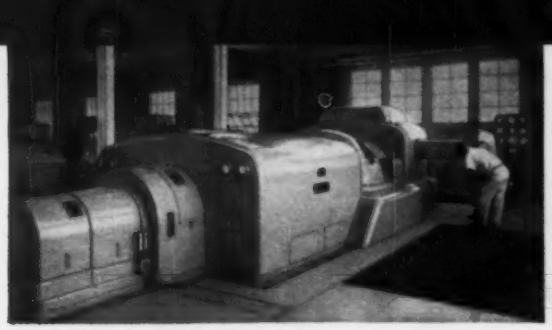
One reason why Fairfield, Illinois has efficient electric service—

Nonpareil Turbine Oil



Plant superintendent James Easton and Standard Oil industrial lubrication specialist Charlie Brown inspect 5,000 kw. Worthington turbine, one of four turbines in Fairfield Municipal Light & Power Company plant lubricated with NONPAREIL Turbine Oil.

These turbine installations trace the record of growth in electric power consumption in Fairfield, Illinois, over the past 19 years:

Type	Turbine Cap.	Installed
Westinghouse	1,500 kw.	March, 1940
Westinghouse	2,500 kw.	March, 1942
Westinghouse	4,000 kw.	March, 1949
Worthington	5,000 kw.	July, 1957

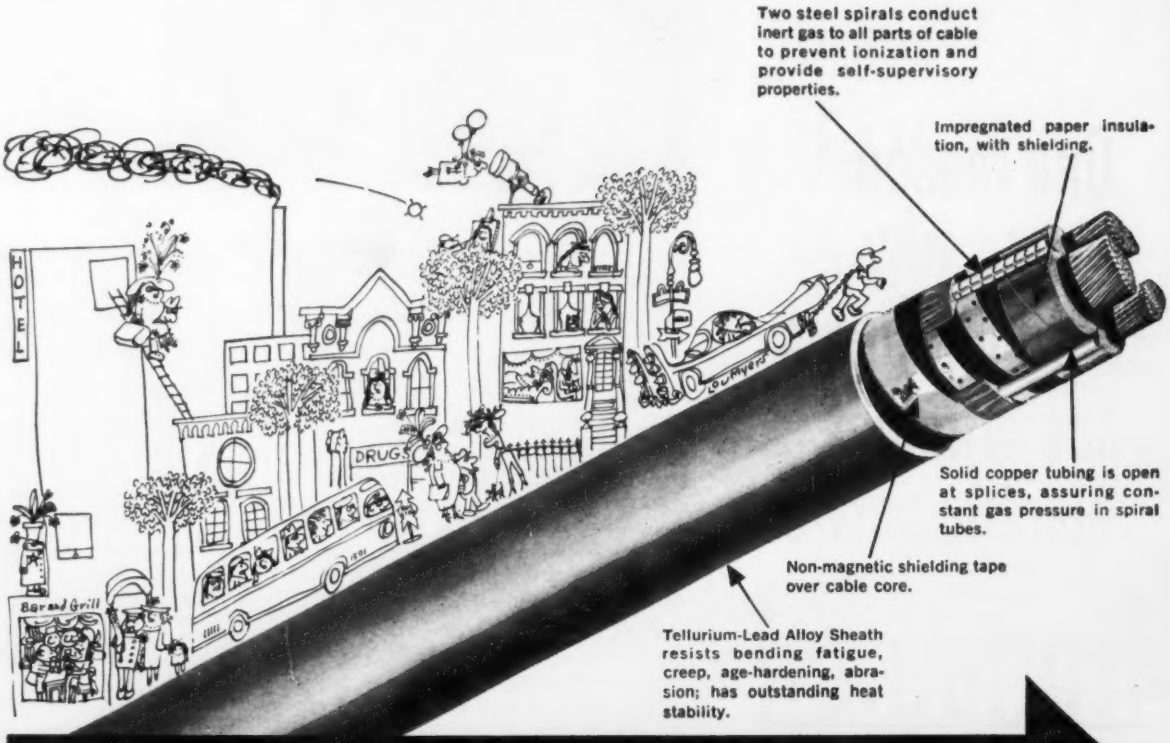
When the first turbine went into service, Fairfield Power plant management decided upon a turbine lubricant they felt would be dependable—NONPAREIL Turbine Oil. Standard Oil, they found, would give them concrete evidence of the oil's dependability. They received a certificate guaranteeing that, for the life of the turbine, the acidity of the oil would never exceed 0.15 mg. KOH/g. Indeed, through the years the oil has remained at a much lower acidity level, usually in the order of 0.06 mg. KOH/g. Periodic analysis of the oil in Standard's Whiting laboratory confirms that the oil is performing according to guarantee.

The kind of service Fairfield Municipal Light & Power gets from NONPAREIL Turbine Oil comes about this way: NONPAREIL is the subject of special refining techniques and handling. A special crude is used as a base stock. All sludge-forming compounds are removed. An oxidation inhibitor which permanently controls acidity is added. No sweetening or resting of NONPAREIL Turbine Oil is required at any time.

Men with experience in turbine lubrication can give you more facts about NONPAREIL Turbine Oil. Call your nearby Standard Oil office in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You expect more from **STANDARD** *and you get it!*

Standard's Charlie Brown, here with Easton, supervised installation of NONPAREIL Turbine Oil in Worthington turbine. His experience and training qualify him for such work. Charlie received science training and graduated from Eastern Illinois State College. He has nine years' service with Standard Oil and has completed Standard's Sales Engineering School.


Two steel spirals conduct inert gas to all parts of cable to prevent ionization and provide self-supervisory properties.
Impregnated paper insulation, with shielding.
Solid copper tubing is open at splices, assuring constant gas pressure in spiral tubes.
Non-magnetic shielding tape over cable core.
Tellurium-Lead Alloy Sheath resists bending fatigue, creep, age-hardening, abrasion; has outstanding heat stability.
HOTEL
DRUGS
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KEEPS UPHILL POWER "ON THE LEVEL"!

ROEBLING
GAS-FILLED CABLE

What happens when solid-type cable is used on steep grades? If you've used it, you know! The oil impregnant simply obeys the law of gravity and drains to the bottom of the grade. At the low point, hoop stress (caused by oil pressure build-up) makes the lead sheath stretch. Eventually a rupture occurs. And in the areas drained of oil, ionization takes place.

What's the answer to this constant (and inevitable) problem? *Roebling Low-Pressure Gas-Filled Cable*—for voltages up to 46 kv! Dry nitrogen gas, inside this cable at approximately 12 psi pressure, provides consistent dielectric properties throughout the length of the cable. No matter how steep the grade, internal pressure is uniform everywhere.

Another feature of this cable is that it is self-supervisory—an alarm system lets you know if there's trouble along the line.

Roebling Low-Pressure Gas-Filled Cable is as easy to splice as solid-type paper power cable. It offers the least expensive long-term answer to the problem of transmitting power uphill! Get the whole story from your Roebling Field Representative soon. Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation

another G-E 8000 development

GENERAL ELECTRIC ANNOUNCES . . .

New Custom '8000'* Motors

PROJECT '8000' . . . a major General Electric program of research, redesign, advanced manufacturing and improved customer service on A-c motors 150 to 6000-hp.

*Trademark of General Electric Co.

CUSTOM DESIGNED . . . New General Electric Custom '8000' motors are built specifically to meet your requirements. Selecting from specially designed enclosures, advanced insulation systems, custom-designed end shield and bearing constructions, and more than 15 custom-designed accessories—plus a countless number of electrical designs—General Electric engineers will create a motor to meet exacting needs, provide initial and continuing economy, and give long, reliable service. Turn page for features of new Custom '8000' motors.

NEW CUSTOM '8000' MOTORS GIVE TOP PERFORMANCE WITH LESS MAINTENANCE . . . HERE'S WHY

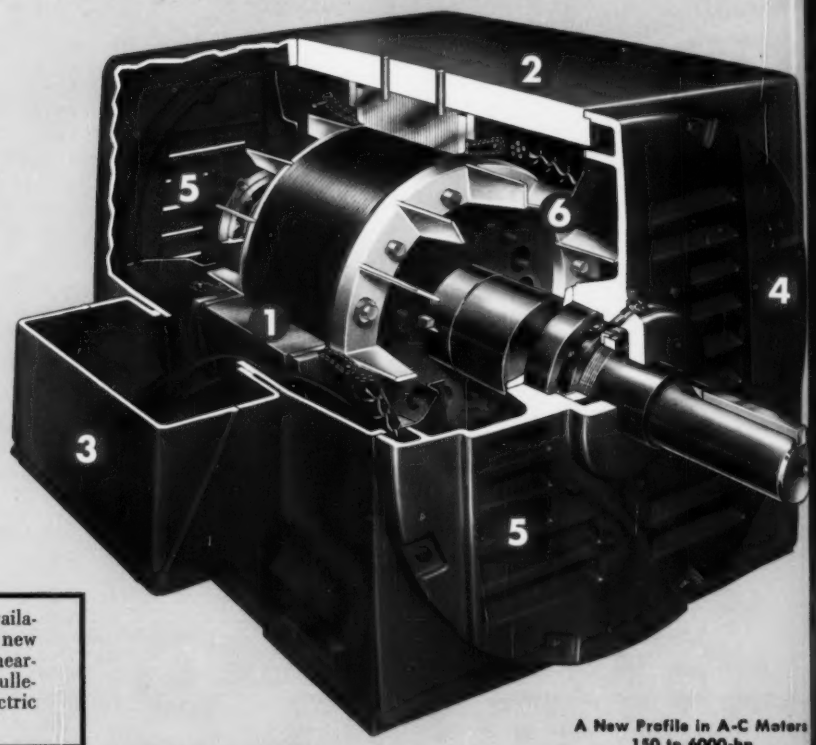
GENERAL ELECTRIC

FROM GENERAL ELECTRIC . . .

another G-E PROJECT 8000 development

NEW Custom '8000'* Motors Give Greater Reliability Require Less Maintenance

1. **LONGER INSULATION LIFE**—Pre-wound core allows closer quality control and gives longer insulation life through improved varnish impregnation or silicone rubber encapsulation.
2. **BETTER CONSTRUCTION**—Cast iron frame withstands 20G simulated transportation shock tests; resists corrosion.
3. **FASTER INSTALLATION**—Conduit box has up to 3 times volume of ordinary boxes; lifting lugs, cast to frame, hold up to 12 times motor weight.
4. **EASIER MAINTENANCE**—Flat end shields are more adaptable to addition of accessories or modifications; are lighter—easily handled by one or two men.
5. **BETTER COOLING**—Double-end ventilation, new duct design and louvred air openings provide more efficient air distribution through motor, reduce hot spots.
6. **LOWER NOISE LEVEL**—Sound power has been cut up to 50% by redesigning frame sections, rotor fans, air deflectors and intakes.



A New Profile in A-C Motors
150 to 6000-hp

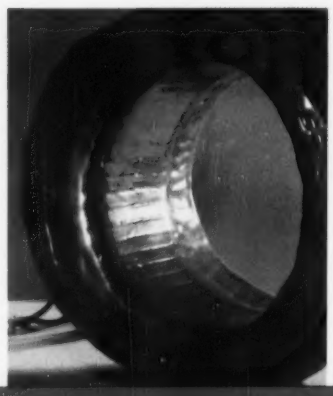
FOR COMPLETE INFORMATION and availability dates about General Electric's new Custom '8000' motor line, contact your nearby Apparatus Sales Office, or write for bulletin GEA-6865, Section 884-2, General Electric Co., Schenectady, N. Y.

NEW Polyseal* SILICONE RUBBER INSULATION SYSTEM IS AVAILABLE ON CUSTOM '8000' MOTORS

Silicone rubber used in Polyseal insulation systems is a product of General Electric's Silicone Products Dept., Waterford, N. Y. . . . a leader in research, development, and manufacture of silicone materials. Supported silicone tape is a development of General Electric's Insulating Materials Dept., Schenectady, N. Y. Combining silicone rubber with dacron-glass supporting materials is a major engineering advancement, giving this material both the mechanical and dielectric strength required for use as a motor insulation. Polyseal insulation systems are available *only* on General Electric motors. Medium AC Motor & Generator Dept.

FORM-WOUND MOTORS

Polyseal supported silicone rubber insulation system provides greater mechanical, thermal, voltage and environmental endurance than unsupported silicone rubber. Glass fabric materials are imbedded in each layer of silicone tape, which, after coil wrapping is vulcanized under heat and pressure to seal the system against moisture and contaminants. General Electric form-wound open motors with Polyseal insulation system can be used in some severe atmospheres formerly reserved for totally-enclosed motors.



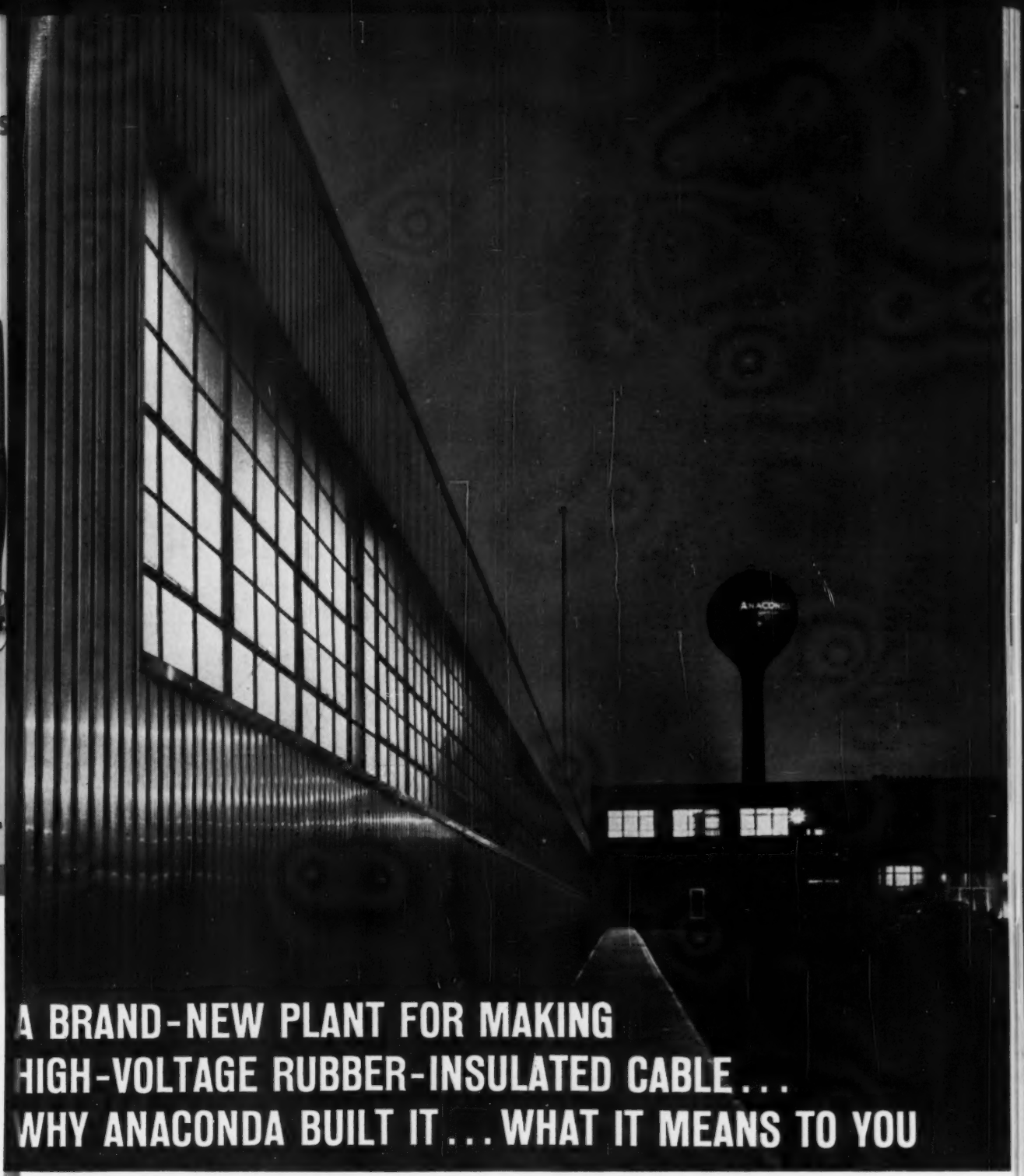
RANDOM-WOUND MOTORS

Polyseal silicone insulation system offers greater flexibility and better heat transfer than existing encapsulations . . . it operates effectively from —90C to 200C and will not crack under excess thermal cycling or severe moisture. After receiving G.E.'s standard random-wound insulation treatments, Polyseal insulation is applied to stator and end turns, completely sealing windings with a thin, waterproof, inert covering which protects against extreme moisture, most chemical fumes, dust and corrosion.

*Trademark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC



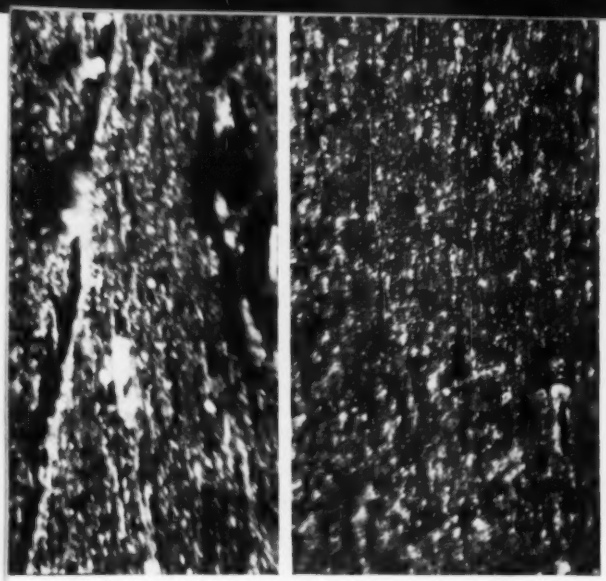
A BRAND-NEW PLANT FOR MAKING HIGH-VOLTAGE RUBBER-INSULATED CABLE... WHY ANACONDA BUILT IT... WHAT IT MEANS TO YOU

Butyl is the most effective rubber insulation yet developed—either natural or synthetic—for high-voltage cable. It has inherent resistance to aging, to moisture, to heat, and most important in high-voltage cable—to ozone.

But—butyl handles differently from other rubbers. And so it demands specialized engineering knowledge, highly specialized equipment, techniques, and precision control at every manufacturing step.

That briefly is why Anaconda built this huge plant at Marion, Indiana—to combine under one big roof the specialists and the specialized equipment needed to make the finest rubber-insulated cable available to you.

Turn the page to see how Anaconda Butyl (AB) Cable was developed and is manufactured. See how each step helps make a better cable for you.



Above you see magnified sections of ordinary cable insulation (left) and Anaconda Butyl (AB) Cable insulation (right).

These screens, used in the extrusion head to entrap possible contaminants, are so fine they actually hold water.

TWO BIG REASONS WHY ANACONDA BUTYL (AB

1. SPECIALIZED DEVELOPMENT

Because Anaconda was the first to develop butyl-insulated cable—and because butyl handles differently from other rubbers—many problems came up during development. Here are some examples—and how Anaconda engineers solved them.

A mixing problem: Like all raw rubbers, butyl in its raw state is a practically useless material. So it's mixed with specially selected additives and ingredients. Because it is very difficult to disperse these ingredients in butyl, Anaconda had to develop an entirely new mixing process and separate facilities to avoid contamination. Look at the comparison photos and see how successful it is.

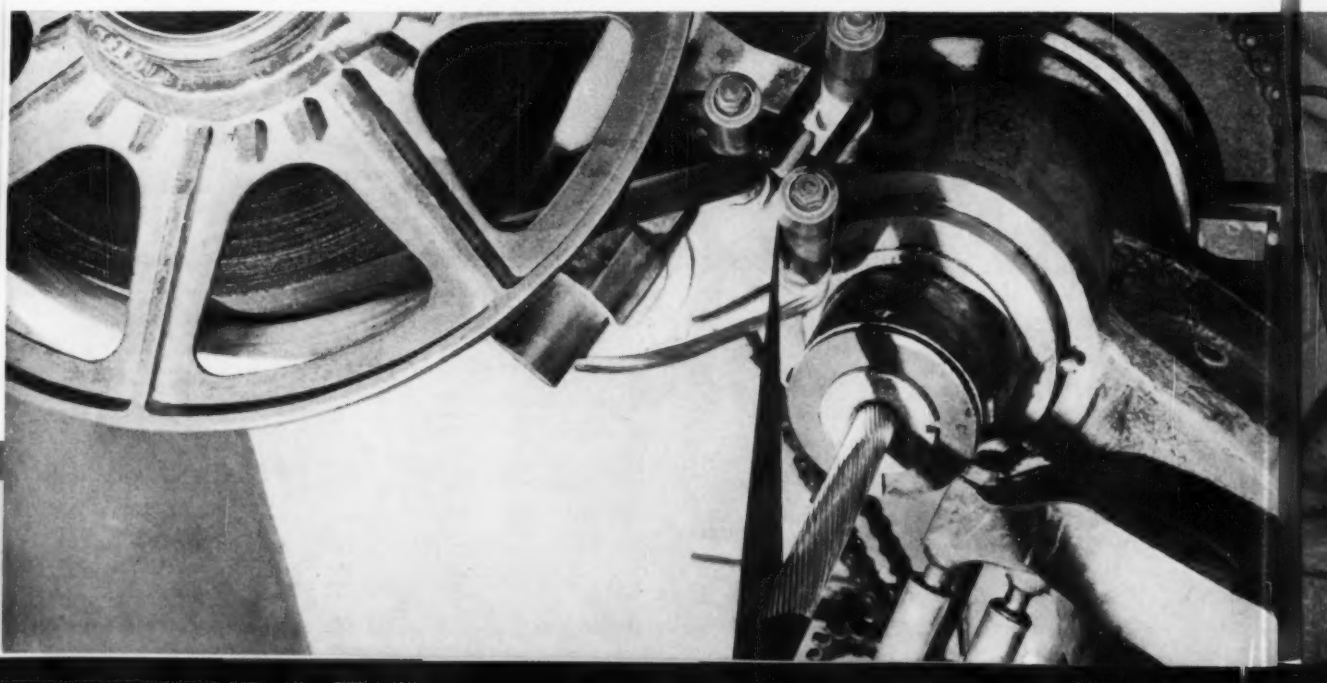
A shielding problem: To eliminate laborious and ti consuming cleaning of insulation surfaces, Anaconda veloped a semiconducting tape* which firmly adhere the insulation—and yet is easy to remove during spli and terminating.

Even a vulcanizing problem: Ordinary vulcanizing eq ment might have a tendency to deform butyl insulation Anaconda developed huge vulcanizing tanks which ad steam faster, vulcanize quicker and eliminate distortio

These few examples show you the types of probl Anaconda engineers were up against. Their solutions h show you why you can be sure Anaconda Butyl (AB) Ca is the finest cable you can buy.

*Pat. appli

Close-up of semiconducting strand-shielding tape being applied to 500-Mcm tinned copper conductor.



An Anaconda development—semiconducting tape—adheres firmly to insulation, yet removes easily, facilitating splicing and terminating.

AE MEANS RELIABLE HIGH-VOLTAGE CABLE

2. SPECIALIZED MANUFACTURE

Anaconda's new Marion Mill was designed to handle only one product—Anaconda Butyl (AB) Cable.

The men behind this highly specialized equipment have but one job . . . to study and improve the design and manufacture of rubber-insulated high-voltage cable. Here are a few of the many places where they built precision right into the production line.

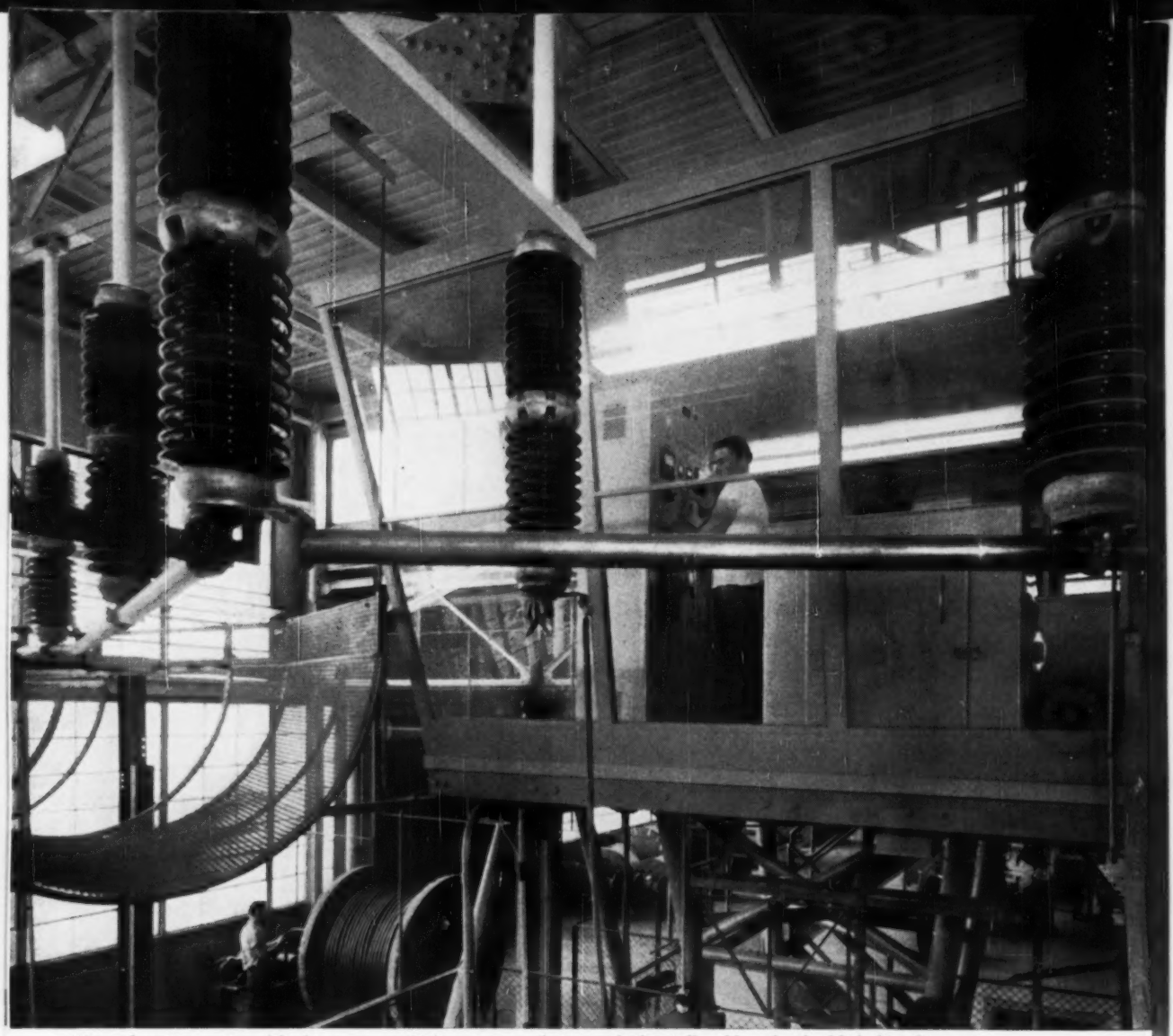
Insulation purity: For extra protection against contamination, the unvulcanized Anaconda Butyl is passed through a series of screens, one of which is so fine it will hold water.

Strand-shield taping: For better equalization of internal electrical stress, Anaconda applies a special fine-mesh semiconducting tape under the insulation of all stranded high-voltage cables.

Vulcanizing in lead: Conventional lead presses must stop periodically for refilling—severely heating up and often damaging the cable section in the die block, so Anaconda extrudes lead continuously. In the next step, exceptionally large drums are used for vulcanizing in lead to eliminate distortion of jackets and insulation.

These few examples help show you that the manufacture of Anaconda Butyl (AB) is highly specialized, highly precise—and why Anaconda offers you the big advantage of consistent high quality.

Huge reel entering large vulcanizing tank which vulcanizes cable quicker than conventional methods, eliminating distortion of insulation.



Shown here is a section of final testing area. Voltage tests are being applied to *full reel lengths* of cable before shipment.

ANOTHER BIG REASON WHY YOU SHOULD CONSIDER ANACONDA BUTYL (AB) CABLE

SPECIALIZED QUALITY CONTROL AND INSPECTION

From the start: Raw-material suppliers are required to submit certified test reports. Then, too, tests and sampling at our plant offer extra protection even before production begins.

To finish: Here's the final inspection line where the finishing touches are applied and where every inch of cable is carefully inspected. Perhaps you already know that Anaconda test procedures are much above industry standards. But do you know that test voltages on Anaconda Butyl (AB) Cable are 125% of industry standards—that minimum corona level is 150% of rated voltage to ground?

Quality control at Anaconda is *more* than mere testing and inspection. It is built into every manufacturing step. That's why you can be sure your Anaconda cable will be high quality—why you can be sure Anaconda Butyl (AB) Cable is the finest rubber-insulated cable you can buy.

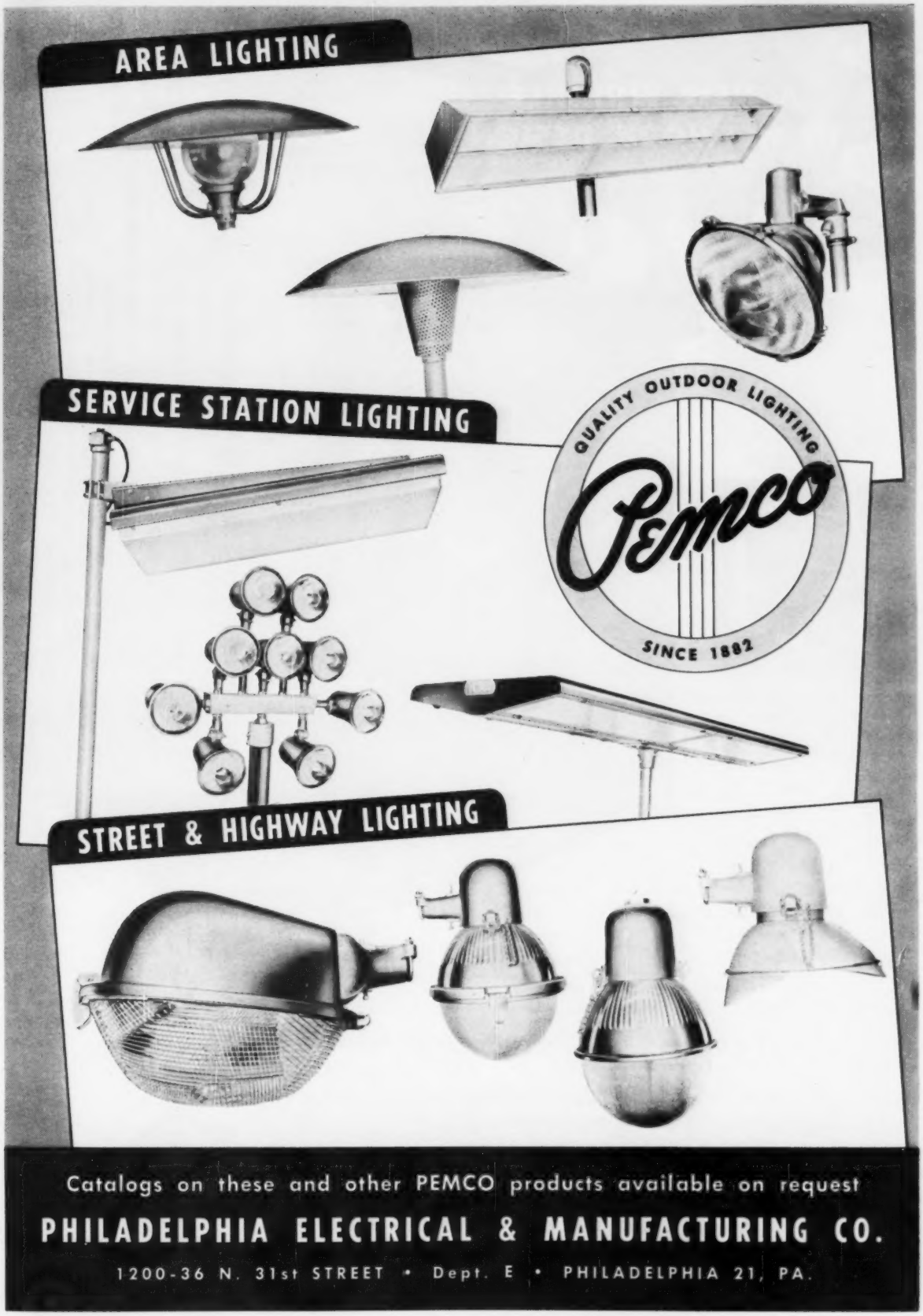
Everything you need to know about Anaconda Butyl (AB) high-voltage cable is neatly summed up in a new booklet, DM-5903, "Anaconda High-Voltage Durasheath* Cable." Write for your copy today.

*Reg. U.S. Pat. Off.

ASK THE MAN FROM

ANACONDA®

ABOUT BUTYL (AB) HIGH-VOLTAGE CABLE



Catalogs on these and other PEMCO products available on request

PHILADELPHIA ELECTRICAL & MANUFACTURING CO.

1200-36 N. 31st STREET • Dept. E • PHILADELPHIA 21, PA.

A NEW WRINKLE IN NETWORK DESIGN

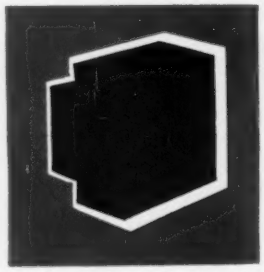
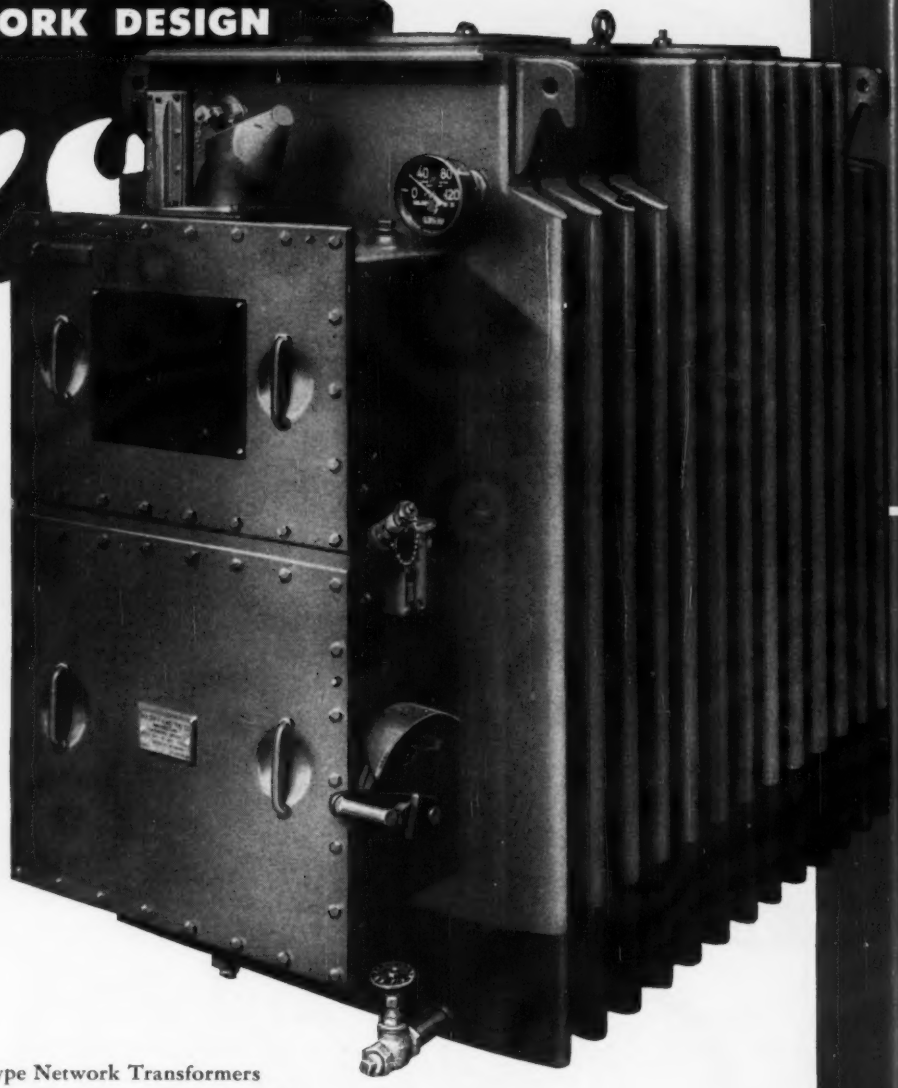


Diagram illustrates savings in space of new design as compared with older type network transformer.



Moloney Subway or Vault-Type Network Transformers with corrugated tanks are strong, rugged units developed by Moloney to answer some of the problems associated with the use of network transformers.

These units are built to conform to the EEI-NEMA Standards for Network Transformers or to conform to customers specifications.

Moloney Network Transformers offer your system the performance, dependability and trouble-free service expected of all Moloney products . . .
Specify Moloney Transformers for Quality . . . All Along The Line.

MEBB-13

MOLONEY ELECTRIC COMPANY

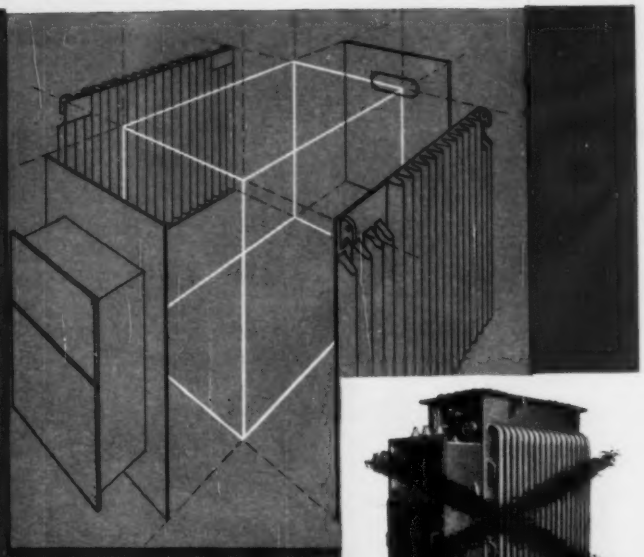
Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

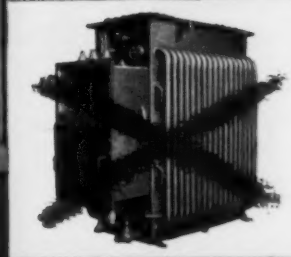
SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

REAL TANK CORRUGATIONS

Moloney Network Transformer tank walls are really corrugated (as shown in diagram) and are welded only at the corners.

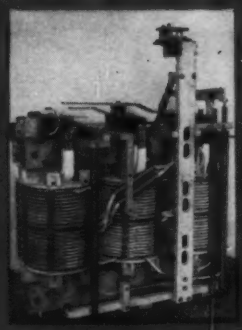
The old problems of corrosion spots and servicing accessibility are gone; now inspection, cleaning and painting is easily done from above.





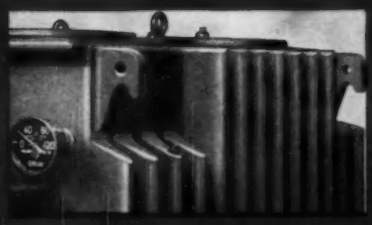
RUGGED CORE-AND-COIL UNIT

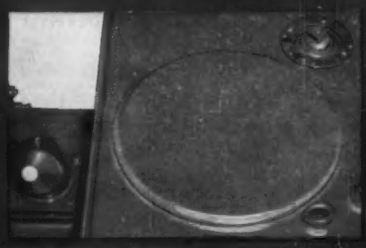
The core-and-coil assembly is a rugged, compact unit solidly blocked and framed. Every lead is adequately insulated and rigidly braced. All bus bars are supported by stand-off insulators. The core-and-coil unit is securely fastened in its position in the tank by adjustable clamps.



INCREASED MECHANICAL STRENGTH

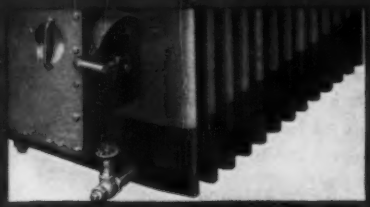
Moloney's ability to corrugate the steel plates of the transformer tank wall produces a tank of inherently greater mechanical strength, thereby eliminating the need for extra bracing.





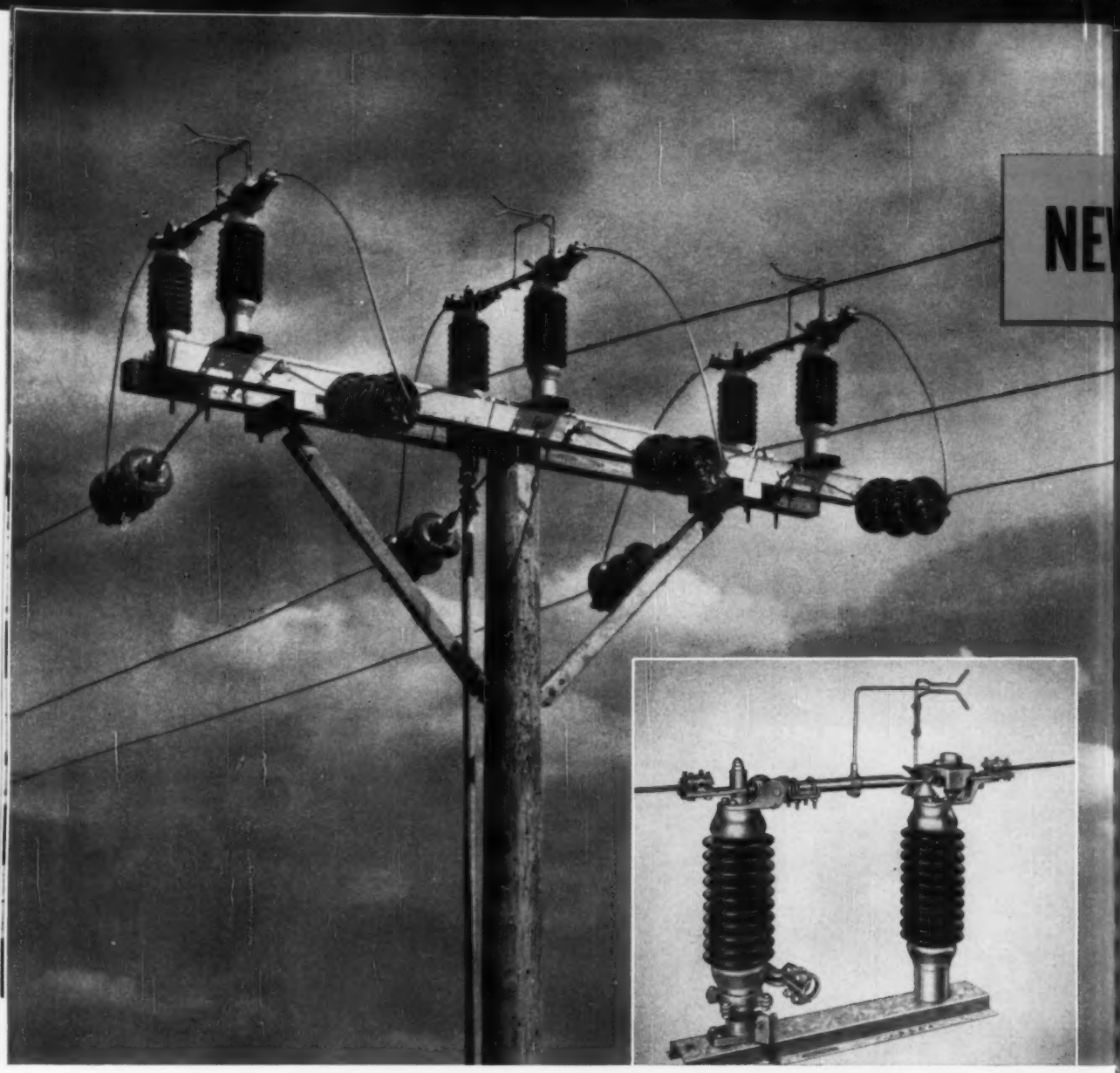
SEALED AGAINST MOISTURE

Gasket-covered cover flanges are welded and machine-sealed to the tank against the entrance of moisture.



UNDERCOATING OF TANK BASE AND LOWER TANK WALLS

Maximum protection against rust and corrosion is obtained by the application of protective undercoating extending on the tank walls to a point above the normal level of silicone liquid.



NO OTHER SIDE-BREAK DISCONNECT GIVES YOU ALL OF THESE OPERATING ADVANTAGES

- **Correct contact always maintained at blade tip even if crossarm warpage distorts the switch base.**
- **All blades engage fully in the break-contact jaws without precise adjustment of the inter-phase rods.**
- **Less time and labor to install with Kearney original wide-tolerance mechanical design.**
- **Easiest, surest ice-breaking ability available on both opening and closing.**

This newest Kearney development solves long-existing operating problems of crossarm mounted group operated side-break disconnects. The best supporting structure or crossarm construction may . . . due to ice loads, age, wind or line strain . . . deflect enough to distort the switch bases, or alter the relative positions of the three phases. This often causes loss of contact or failure of all blades to close completely in conventional disconnects with both rigid blades and stationary break-contacts.

Kearney's advanced design features a self-aligning blade constructed to permit controlled vertical movement and axial rotation. This automatically compensates for base distortion . . . keeps the blade tip correctly aligned in the contacts. The break-contact swings 30-degrees with the blade as it is opened or closed, producing high leverage ice-breaking ability and full wiping of the silver current transfer surfaces. On closing, the blade tip fully engages the break-contact before the contact moves from its angular open position, compensating for any shift in position of the switch bases. This same feature also allows considerable freedom in interphase rod adjustment, enabling Kearney *Self-Aligning* side-break switches to be installed faster and more economically than other types.

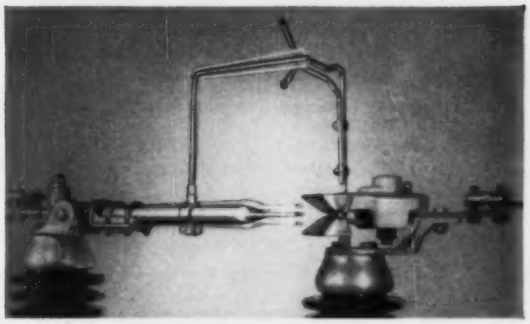
The details of these original features for maintenance-and-adjustment-free operation are shown on the facing page.

Kearney's

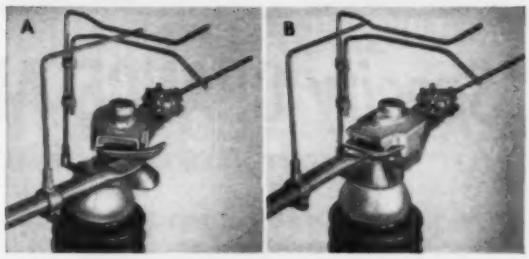
Self-Aligning SIDE-BREAK DISCONNECTS

...always make positive contact, even if the supporting structure warps, twists, bows or settles.

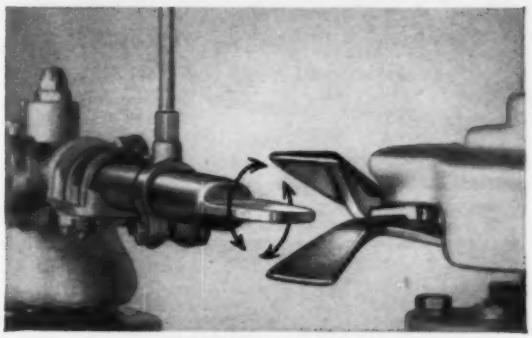
Self-aligning blade moves in a vertical plane to re-establish the original relationship between blade tip and contacts if supporting structure warpage distorts switch base. Wide mouth contact jaws assure blade entry into the contacts. Vertical 1¼" movement more than corrects for extreme cases of misalignment.



Break-contact swings 30° in the plane of blade travel as switch is opened or closed, providing highest leverage ice-breaking and full wiping of the current transfer surfaces. Note that the blade tip is fully engaged, and full contact is maintained (A) through the final 20° of blade travel to the fully closed position shown at (B). This feature allows more latitude in phase rod adjustment than other designs.



Blade rotates 12° on its longitudinal axis. If base distortion has affected blade-contact alignment, the blade tip will rotate as it enters the break-contact to keep all contact surfaces parallel, automatically restoring contact alignment. Friction reducing construction at all rotation points mininizes operating effort.



Switch carries full-rated load current well within NEMA temperature rise, from a fully closed position to 20° partially open position. Ratings available, 7.5 through 69 kv, 600 amperes. Equipped with conventional or whip-type arcing horns... torsional or spade-type operating mechanism. May be mounted horizontally, vertically, or underhung.

For full details talk to your Kearney representative, or write direct for Bulletin 8B.

JAMES R. KEARNEY CORPORATION

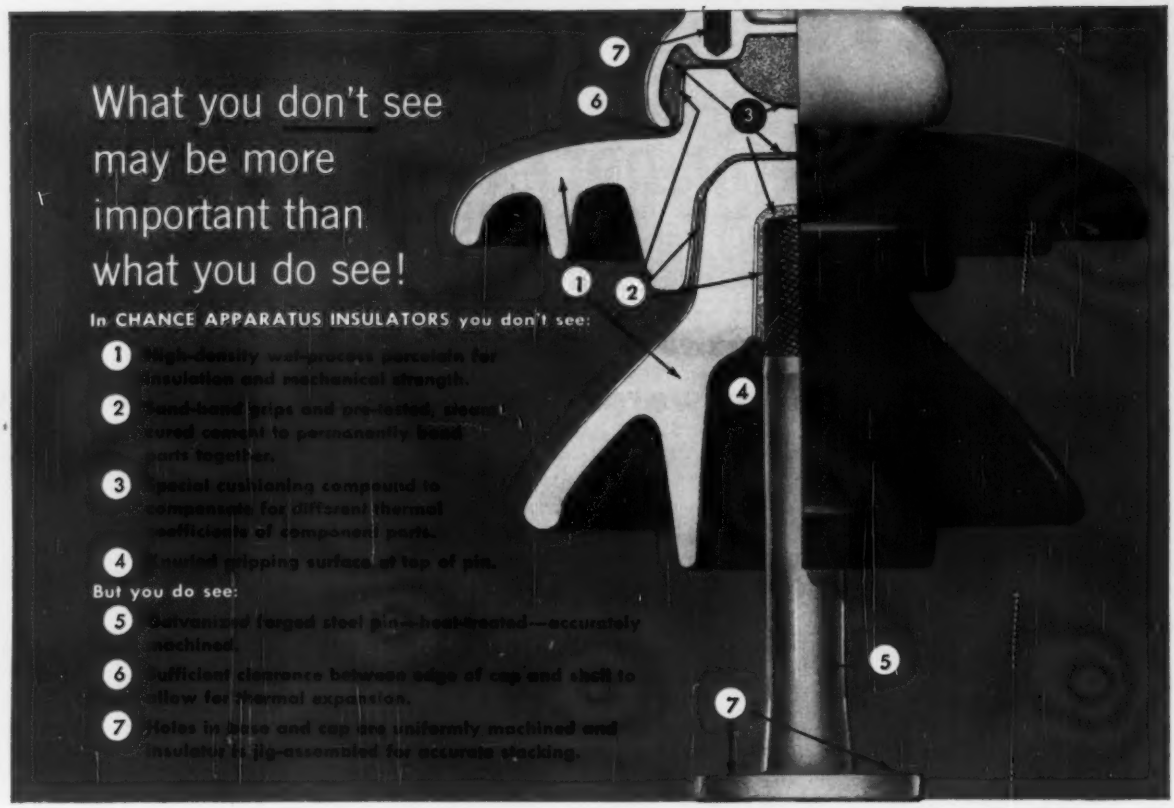
4224-42 Clayton Avenue, St. Louis 10, Missouri

397

FOR BETTER CONSTRUCTION... SAFER MAINTENANCE

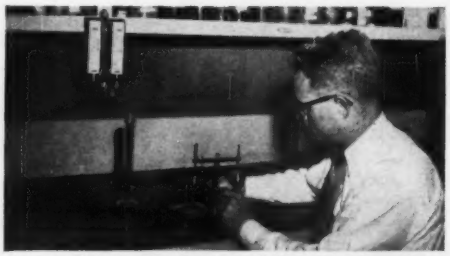
Specify Kearney Products

Plants at: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

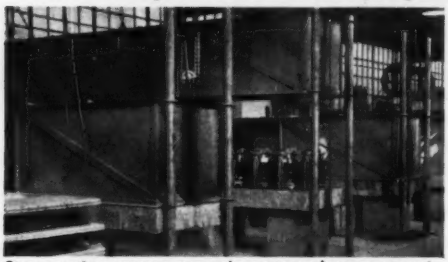


Specify CHANCE APPARATUS INSULATORS

for station insulators you can install and forget



Gilmore Needle Test is given all incoming cement to guarantee maximum cement strength.

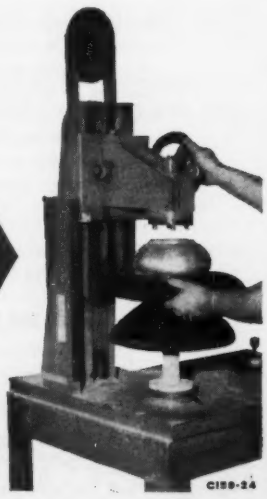


Steam curing process properly ages and cures cement bond to withstand the rough service of switching.

You can't see many of the hidden values that make Chance Apparatus Insulators perform so well—last so long. You can't see the quality of the cement—how well it is cured and properly aged. You can't see the inner construction features or the density of the porcelain...

But these hidden values are just as important to insulator durability as the many fine features that you do see when you examine a Chance Apparatus Insulator.

You can specify the insulators you want for your switch-gear—have the same uniform top quality insulators in your stations and on your lines. Just ask for Chance porcelain on all switch and bus specifications—no extra cost or trouble—and be assured of the best in substation insulators.



Every process, every part, every insulator is repeatedly checked through the entire production cycle. Here is an alignment check to assure absolutely accurate stacking for switch assembly. Every Chance Insulator is a "carbon copy" of the proven master design.

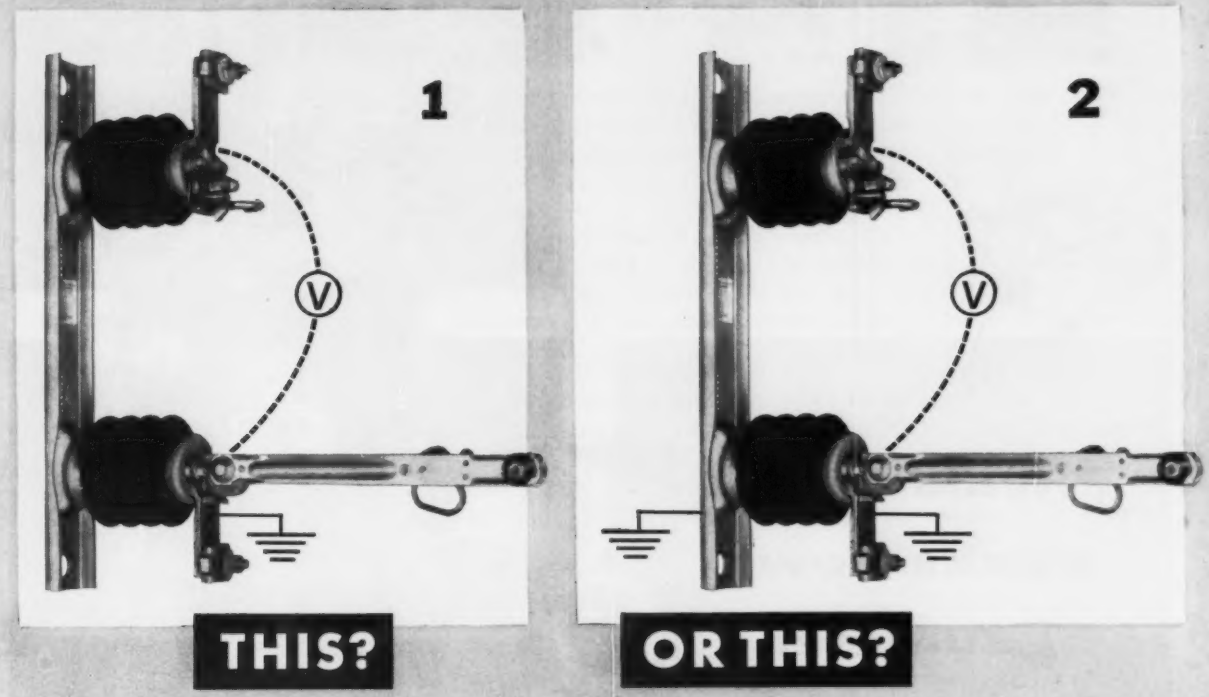
You KNOW it's right when you specify CHANCE

A. B. CHANCE COMPANY CENTRALIA, MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

CI59-24

Q: Which Test Shows a 95 Kv impulse withstand for S&C's 15 Kv LOADBUSTER DISCONNECT?



A: *Both confirm 95 kv for S&C's* LOADBUSTER DISCONNECT.

Test 1 is a less rigorous test. With the base "floating," conventional disconnects can often meet the 95 kv test. But this is an unrealistic condition, for in actual installations the base may be grounded . . . deliberately or not. A disconnect may be mounted on steel, or—even if on a crossarm—wet weather may wash out the "margin."

Test 2 with *base grounded* presents two parallel paths to ground. Under this severe condition S&C's Loadbuster Disconnect meets a full 95 kv impulse withstand.

There are no established AIEE or NEMA standards for this class of disconnect. Nonetheless for lineman safety S&C chooses to meet test 2, another "extra" at no extra cost.

Descriptive Bulletin 721 gives the full story on this remarkable disconnect. Bulletin 721 tells, too, how you can get low-cost load switching anywhere on your distribution system by using this disconnect with LOADBUSTER (the portable loadbreak tool). Write to S&C Electric Company, 4435 Ravenswood Avenue, Chicago 40, Ill.

S&C ELECTRIC COMPANY

ALLIS-CHALMERS modern line for '59

"Private-eye" tracks down summer overloads

Thermalite indicator singles out overloaded unit

Plan to stay ahead... MODERNIZE!

With the *Thermalite* indicator doing your gum-shoeing, you can spot overloads the easy way — from a cruising service truck. The need for expensive surveys is eliminated. Replacement or any other system change can be made at your convenience.

Greater Utilization

You can stretch transformer dollars by taking advantage of inherent overload capabilities of distribution transformers. *Thermalite* indicators let you use this capability without disrupting service continuity. For complete information, call your A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Thermalite is an Allis-Chalmers trademark.

A-C ALLIS-CHALMERS

A-5998-E

Editorial Comment

AUGUST 31, 1959

When Is a Friend?

There is no more heart-filling experience in the world than to be flooded by unsolicited offers of assistance following close upon serious trouble. This warm feeling frequently has come to personnel of utilities stressed by disaster. A recent case is that of Montana Power Co, whose territory was rocked by an earthquake of majestic proportions.

As soon as news of the giant temblor broke, the company was besieged by telegrams and phone calls from utilities near and far, manufacturers, distributors and countless others in the industry. All demanded to know how they might be of aid—how they could swing their specialized skills and possessions to the side of the presumed-stricken utility.

Luckily, Montana Power itself was not hard hit. Although the quake wreaked tragedy and property destruction in its territory, the company's only damage was at non-power-producing Hebgen Dam. The rest of the system rode out the disturbance nicely. Thus the utility was able gratefully to decline the proffered aids.

To us, the responses that typically follow such occurrences in this industry indicate clearly how rivalries and minor differences are forgotten when the chips are down. We only wish it didn't take Nature's disasters to engender such wholehearted common purpose.

Don't Hide Your High-Level Light Under a Bushel

Many utilities have taken to the new higher lighting levels like the proverbial duck to water. This fact stands out in analysis of Electrical World's Annual Lighting Progress Report which appears in this issue on pages 61-72.

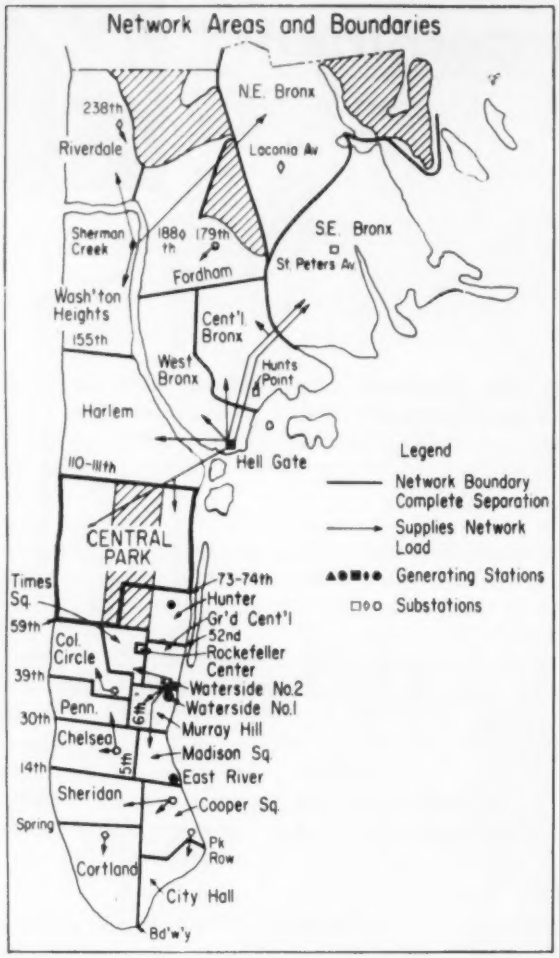
For a number of utilities, the Blackwell Report, the basis for all the new recommended lighting levels, merely substantiates what they have already discovered—that high-level lighting is wanted and needed by the country's commercial and industrial establishments. Now the report has given them concrete evidence supporting this stand.

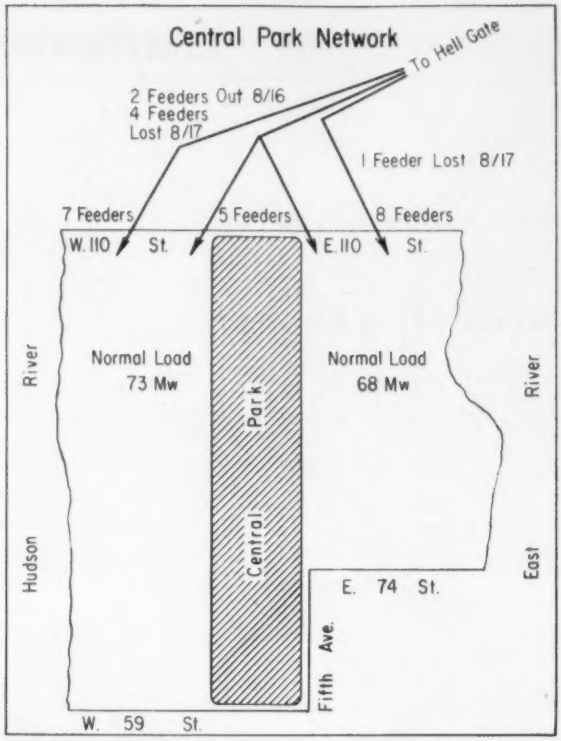
Other utilities, meanwhile, have indicated that the higher levels will occupy the top slot in their future lighting promotion plans.

For the first time the industry has a lighting report based on valid and scientific fact. The research was done by an impartial agency who was merely interested in the facts of the case. Therefore, the customer cannot accuse utilities of setting their sights at an arbitrarily high level.

But facts and figures, no matter how encouraging or how convincing, are of no use unless they are widely used and promoted and utilities clearly stand to gain in proportion to their efforts.

They, therefore, must get out and sell top-grade lighting. That it can be done has been proved by utilities who already have high-level installations in their service areas. We hope the others will take the lesson to heart and "go out and do likewise."





CENTRAL PARK NETWORK is fed over 20 cables from Hell Gate. Park divides area into east and west sections. Ties across Park are two light low-voltage circuits along roadways

NEW YORK NETWORKS are each supplied from one source. Twenty feeder faults a day have occurred on system without outage. Trouble rate is 24.9 per 100 mi a year

N.Y. Cable Failures Fit No Pattern

Timing and location of seven cable failures are charged to chance. Con Ed engineers find no evidence of overload

The long arm of coincidence, rather than overload or high temperature, is the explanation of Consolidated Edison Co of New York engineers for the rapid-fire series of 13.8-kv feeder cable faults that hit the company's system Aug. 17. The faults culminated in an outage to the Central Park network and left half a million New Yorkers without electric service from eight to 13 hours (EW, Aug. 24, p 42).

The nature of the faults, their number and location, as well as the age and condition of the cable affected, are described as characteristic of those that commonly occur on large network systems in the course of normal operation.

However, the circumstance of timing, which resulted in five of the seven failures within a period of 3½ hours on one of the hottest days of the summer season, remains undetermined and is being charged to chance by Con Edison operating officials, on the basis of preliminary investigation.

Con Edison's networks are designed to operate and supply full load with any two feeders out of service at time of peak load. Experience has shown operation with three and even four cables out is possible under some conditions. The affected Central Park network area load at the time of the failures was 141 Mw with an expected peak of 157 Mw. The area's 20 feeders have an emergency capacity of 229 Mw. With two feeders out of service, as was the case the morning of Aug. 17, remaining feeder capacity was 204 Mw—presumably ample for the peak expectations, without overload. Yet in the 3½ hours after 11:33 am five more feeders failed, bringing the total feeders out of service to seven.

Layout of the Central Park network complicated service maintenance under these conditions. Central Park, as the accompanying map shows, is a natural barrier dividing the network into practically independent east and west load areas that are virtually independent except for two light low-voltage ties

across transverse roads. Eight feeders supply only the east side. Seven supply the west section and five supply both sections.

Six of the seven feeder failures were in the group of seven supplying the west section. This left only six of 12 feeders available to keep the west side in operation. To continue them in service risked overload and not only resulting damage to cable and transformers but random operation of network protectors and secondary network fuses. This would "break up" the network and require vault-to-vault inspection that would multiply restoration time many fold. Thus it was necessary to drop load in the west section till enough feeders could be restored to carry its load.

However, since five feeders served both east and west sides of the area, and one of the eight supplying the eastern area was also out of service, dropping the west portion would leave only seven feeders to supply the east section—not enough to carry the load. Consequently, supply to both sections of the area was dropped to protect the network and facilitate early restoration of service.

These are the facts and circumstances surrounding the failures:

- Feeder cable involved was paper-insulated lead covered, some single and some three-conductor. It ranged in age from 1912 to 1957 and in conductor size from 800 MCM to 350 MCM.
- History of the affected feeders is difficult to trace because none of them has the same starting and terminating points that it had originally, due to changes in network patterns over the years.
- All feeder faults relayed out on ground current; none on overload. Four of the feeder faults were at cable joints, three in cable sections.
- Number of the feeder faults was not considered significant since as many as 20 feeder failures a day have occurred on the Con Edison system, scattered over the five boroughs. Con Edison engineers believe these seven failures occurred in strategic locations in one network at one time by coincidence.
- But even in this instance the faults did not occur in one isolated area but were spread from points near the Hell Gate Station to points deep in the network.
- Preliminary inspection of the faulted joints and cable sections revealed no unusual conditions, it was reported. There was no drying or browning of the paper tapes as had been the case in the epidemic of cable failures in July 1955.

In a report to New York's Mayor Robert F. Wagner the city Dept of Water Supply, Gas and Electricity charged Con Edison with responsibility for the massive power outage. Commissioner Armand D'Angelo said Department engineers believed there was insufficient feeder capacity on the west side and that this caused an overload.

D'Angelo said he will appoint an outstanding independent engineer to make a comprehensive study and report to him on inadequacies and remedial steps.

Con Edison replied with a statement that the Commissioners report was "clearly premature," adding that company studies, though incomplete, indicate that there "were not overloads." "Thus far the evidence gathered from our study is that the power shortage was caused by the happenstance of a group of failures serving a single area at a particular time," said Earl Griffin, senior vice president of Con Edison. "We categorically deny any inadequacy in our system."

Network Is Split to Speed Service Restoration

Splitting the Central Park network into its east and west sections was the key operation that speeded restoration of service in the massive Consolidated Edison Co interruption of Aug. 17-18. As a result, the eastern portion of the area was returned to service five hours before general restoration was completed. Moreover it let the greater part of the 1,620-man emergency work force be deployed where needed.

The east and west portions of this 5-sq-mile network are physically separated by Central Park. As the map shows, seven primary feeders supply only the west portion, five feeders are common to both east and west sections, and eight supply the east section only. Ties across the park consist of only two secondary circuits along transverse roadways.

When it was established that six of the seven failed feeders supplied only the western portion of the network, it was most expeditious to separate the eastern from the western portion in order to get service back earlier.

To accomplish this separation, it was necessary to cut the ties across the park and to inspect and block open the 110 transformer network switches, in the western portion of the network, supplied by feeders common to both sections.

The log of the failure and restoration operations follows:

Monday Morning, Aug. 17—Two feeders out of Hell Gate Station serving the west section of the Central Park network were out of service and repairs being made. Along with 18 others, they cross the Harlem River and go express to transformers in the Central Park network.

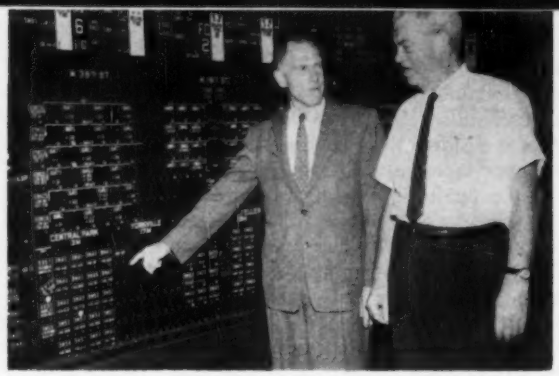
At 11:33 am a third green light appeared on the system control board indicating automatic opening of a third feeder breaker at Hell Gate. This meant loss of another feeder to the west side. Hell Gate operator called Harry Otten, manager of system operation, to announce the new situation.

Although the Con Edison networks are designed for a two-feeder contingency at time of peak, operation has shown that network operation is still practicable with three and even four feeders out under some conditions. Otten and his staff began reviewing loading on the 17 feeders in operation.

The Service Bureau dispatched inspectors to take ammeter readings at known overload points.

Test crews were already applying dc tracing signals to cables and using exploring coils in suspected manholes.

At 2:14 pm a fourth west side cable relayed out on ground current. Operating procedure now called for



GREEN SIGNAL LIGHTS on system control board marked failure of feeder cables supplying Central Park network. Harry Otten, manager of system operation is shown with Richard Lombard, senior district operator at panel

NETWORK WAR MAP operated by outside plant engineers to plot location of cable failures and supply system operator with transformer locations and other data. At board is John Neubauer, assistant outside plant engineer

load reduction and expansion of the work force. The sales department was asked to call certain large customers to ask a reduction in usage.

At 2:19 pm the fifth primary feeder serving the west section of the Central Park network went out.

At 2:33 pm a sixth feeder relayed out. Up to this point all damage and activity was on the west section of the network.

"We recognized then that we had to shut down the west section. We still saw a chance of saving the east. But it takes time to relay information from the field to station operator who must then identify the proper controls," Otten explained.

At 2:49 pm verification of switching instructions from the system operator to dump all 12 feeders supplying the west section of the Central Park network was completed and they were executed.

At 2:56 pm the seventh feeder relayed out of service. Unlike the others, this feeder supplied the east section of the network. Its loss left only seven feeders to supply the eastern portion. This was not sufficient to carry the load.

At 3:00 pm the remaining portion of the network was dumped.

Public authorities were told there "was little chance of getting anything back before midnight—hopes center on getting back by 8:00 am."

Another work force was ordered into the field. These men went from building to building pulling service switches, starting at the south boundaries of the network area. This was the start of preparations for re-energizing cables. Dayside men had been held on the job.

The public information department worked through the night keeping a regular flow of information to newspapers, radio, and TV.

By 9:00 pm it was apparent that power could be restored to the east appreciably before the west if the two sections were separated. Use of the five feeders that normally served both sides of the network was essential to such an operation. It meant blocking open by hand the 110 network protectors on the west side associated with these five cables. Secondary ties across Central Park had to be severed.

At 9:50 pm repairs to the only faulted east section feeder were completed.

At 10:30 pm the network west side protectors were reported open.

To re-energize the east side 13 breakers had to be closed simultaneously. Breaker operating handles on identified circuits were marked with tape. On countdown they were closed by a team of seven men.

At 10:50 pm all eastern section breakers had accepted load. No fuses blew. All breakers went in. Before the countdown the Hell Gate operator ordered bus voltage raised 500 v above normal to compensate for reactive kva. Circuits picked up 33 Mw. Five minutes after pickup, load had increased to 50 Mw.

Three of the five feeders normally supplying both sides of the network were needed to pick up the western section of the network, however. Load on the eastern section had stabilized enough to permit three of these feeders to be opened at Hell Gate. Crews were dispatched to block closed corresponding protectors in the west section. This took until approximately 2:00 am.

By 3:30 am repairs on all but two of the feeders to the west side were completed. On assurance that one would be available by 8:00 am preparations were completed to start the west section.

At 3:42 am eight feeders supplying the west section of the network were closed. They were five of the seven supplying the west section only, plus three for dual west-east use. Cables picked up 36 Mw.

By 8:00 am Aug. 18, 19 feeders had been returned to service.

Log on Central Park Feeder Trouble

Feeder No.	Time Out	Fault Location	Nature of Fault	Repairs Completed
3M49	11:33 am	82 St & Broadway	Tee Joint Fault	8/17/59—9:30 pm
3M46	2:14 pm	132 St & Cypress Ave	3 C Cable Fault	8/18/59—4:55 am
3M47	2:19 pm	87 St & Amsterdam Ave	3 C Cable Fault	8/18/59—2:50 am
3M52	2:33 pm	110 St & First Ave	3C Cable—Adjacent to Joint	8/17/59—9:55 pm
3M43	2:56 pm	97 St & Second Ave	Tee Joint Failure (Underwater)	8/17/59—9:50 pm

Hebgen Shakes Off Earthquake Jolts; Durability Studied

Montana Power's 44-year-old storage dam's concrete core cracked in three places but stands fast despite a 7.8 Richter intensity and lake oscillation. System output not affected

Hebgen Dam, a concrete-core earthfill project controlling 345,000 acre-ft of water, escaped major damage Aug. 18 when an earthquake jarred large sections of the Northwest. The 44-year-old Montana Power Co dam suffered three small cracks in the core and one crack in the 4-in. of concrete facing on the spillway. This and damage to the powerhouse, which provides power for the dam's illumination and gates, were the results of a quake that registered an intensity of 7.8 on the Richter scale. San Francisco's devastating 1906 quake measured 8.25.

The storage dam held up despite lake oscillation, which splashed a 20-ft wave of water over the spillway, and a series of aftershocks on Aug. 18 and Aug. 23. The U. S. Bureau of Reclamation is studying the dam with the aim of determining how the structure withstood the shocks so effectively.

A rockslide 7 mi downstream from Hebgen caused nine known fatalities of campers. This slide stacked a 200-ft high barrier in Madison River canyon and created a reservoir area with about one-tenth the capacity of Hebgen Lake.

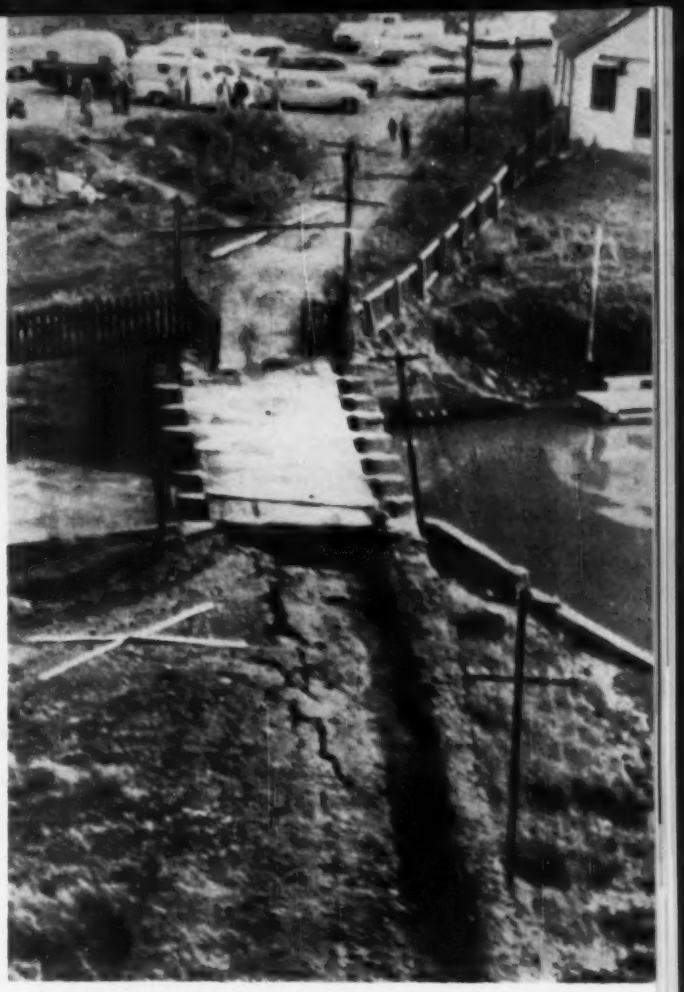
Hebgen does not feed any power into the MPC system. The dam is a control point for eight downstream company dams, in addition to U.S.B.R.'s Canyon Ferry Dam. The U.S.B.R. has offered its cooperation in regulating water flow for the seven MPC dams north of Canyon Ferry. And 2,051,000 acre-ft of storage capacity at Canyon Ferry assures ample water for the plants downstream.

Offers of manpower and equipment flooded MPC's offices after the quake, Pres Jack Corrette said. Since the system's power output is unaffected, the assistance of neighboring utilities and manufacturers was not needed, he added.

Waves Lowered Storage Level Two Feet

The earthquake's initial shock started heavy waves in Hebgen Lake. At least three cycles sloshed water over the dam and lowered storage level about 2 ft. The first shock also lowered the spillway side of the dam 8 to 10 in. causing some leakage.

Hebgen Dam has a concrete core wall down to bedrock varying from 8 to 90-ft thick and extending the 728-ft length of the structure. The core wall was backfilled with rolled earthfill that is 237-ft thick at streambed at the downstream side and 265-ft thick upstream. This includes 2 ft of rock paving on the



LEAKAGE DEVELOPS as spillway abutment (top) drops about 10 in. Montana Power says leaking is negligible

WATER CAPACITY at U.S.B.R.'s Canyon Ferry—downstream from 9-Mw Madison Dam—is ample for MPC's hydro needs

RESCUE OPERATIONS center at dam where "OK SOS" indicates some 40 people are all right. Nine died in slide

POWERHOUSE DAMAGE interrupts 200-kw serving Hebgen operations and camp. Waves splashed over onto house

upstream side. MPC lists the dam as 87.3 ft in height above streambed.

Widest of the three cracks in the core measures 2 in., the company said. Some leakage resulted. If the concrete core is found to be badly fractured, a grouting program will be undertaken. Repairs are under way on the building housing the dam's small dc and ac generators. Damage in terms of repair cost on the dam is not possible to determine yet, MPC said.

Fortunately for people trapped by the landslide the company has a recreation and meeting building at the dam where about 40 vacationers gathered to be rescued by boat and helicopter.

The Corps of Engineers is attempting to free the water backed up by the rockslide below Hebgen. Bulldozers are clearing a road to the top of the rubble where a ditch may be dug to release water before the head becomes high enough to endanger the town of Ennis, some 35 mi north of the slide area.

The 600 or so Ennis townspeople were evacuated soon after the quake's first shock. Their return will hinge on how soon the Corps of Engineers can safely tap the rockslide barrier. Corps engineers estimated that the rockslide might back up as much as 50,000 acre-ft of water. An MPC engineer said it would take 30-40 days for the water to top the rubble.

Hebgen Dam is in the center of the area hardest hit by the shocks. Seismologists reported readings in a region bounded by British Columbia and Utah on the north and south, and by the Washington coastline and the Dakotas on the west and east. Last Sunday another tremor dumped a slide over a roadway above Hebgen. Montana Gov J. Hugo Aronson said he might declare the stricken section a disaster area.

Co-ops Seek $54-Million Loan

Hoosier group, now made up to 16 systems, wants the record amount for 198-Mw steam plant and 1,400 mi of line

Hoosier Cooperative Energy, Inc —the controversial Indiana co-op federation—put the fat back in the fire last week when it re-applied to the Rural Electrification Administration for a whopping $53,872,000 loan.

This application, by far the largest on record with REA, would be used by Hoosier to build a 198-Mw steam generating plant at Petersburg, Ind., and to construct about 1,400 mi of transmission lines to carry the power to 16 member co-ops. These co-ops serve about 71,500 customers in 32 southern Indiana counties.

Hoosier sought a $42-million loan in 1957 to build the same-sized power plant at the same site, but at that time it asked to build only 830 mi of transmission lines to serve seven members.

The '57 application, however, had called for joint construction of the generating plant with Richards & Associates, a Georgia firm which planned to build an aluminum plant in the vicinity—and also planned to take much of the power to be produced at the Hoosier plant.

The earlier Hoosier application was caught up in a political donnybrook which clouded the whole issue. That application collapsed when the aluminum firm pulled out of the deal, and Hoosier never resubmitted an acceptable application to REA. Public power advocates—strongly supported by the National Rural Electric Cooperative Assn—charged that the Eisenhower Administration and the Indiana state government had banded together to squelch the earlier application, and the charge eventually became a major political issue in last year's Indiana gubernatorial election.

Hoosier's new application calls for use of the proposed steam plant's power entirely by its member co-ops—no special industrial or commercial loads are mentioned.

Murray Seeks 1960 Passage of Resources Bill

His measure and identical House bill aim for permanent White House council and joint committee on natural resources

A permanent "Natural Resource Council" in the White House and a "Joint Congressional Committee on Natural Resources" are the aims of new legislation introduced last week in the Senate and House.

Sen James Murray, who is principally responsible for the legislation, and 31 co-sponsors introduced the measure in the Senate and Rep Lee Metcalf (D-Mont.) brought up an identical measure in the House.

Murray hopes to have the bills passed by Congress during 1960. He plans to hold several field hearings on his bill during the fall and winter, and final hearings early next year in Washington, D. C.

Murray claims the idea for this legislation originated with the Hoover Commission report, which recommended establishment of a department of natural resources. He admitted this would be difficult to do, whereas an executive council and a joint congressional committee might achieve the same purpose.

Sen Frank Moss (D-Utah) points out that the proposed legislation "will not duplicate or interfere with legislative committees or administrative agencies now in existence . . . This bill would establish in the resources field what the Employment Act of 1946 created in the economic field. The Council of Economic Advisers has brought forcefully to the attention of the public and of local, state and federal governments, the current economic situation. Its report defines the most important problems to be faced each year."

The proposed White House council, under terms of the bill would be required to publish an annual "Resources & Conservation Report," containing a review of the status of major resources and suggestions for needed legislation.

Moss points out that the council and joint committee are "necessary" to establish an "overall-national resource policy and program." And Murray adds that, even if the White House council "did nothing," its very existence would be "helpful" in focusing attention on the issues.

Both bills (S-2549 and HR-8661) have been referred to their respective Interior committees for action.

A Correction

In the August 17th issue, the story concerning National Rural Electric Cooperative Assn's "Silver Jubilee" program on page 55 contained the incorrect statement that NRECA's 1960 annual convention would be held in Louisville, Ky. The annual convention in 1960 will be held in St. Louis, Mo., Feb. 22-25. The names of the hotels are not yet available.

Public Works Bill Faces Possibility of Veto

Fiscal 1960 would bring 75 new construction starts despite President's budget message request for a breathing spell

A compromise $1.2-billion Public Works appropriation bill for fiscal 1960 was agreed to last fortnight by Congress, but in its immediate future is the definite possibility of a Presidential veto.

The bill (HR-7509) is $57 million lower than the Senate version, $23 million higher than the House version, and it includes at least 75 new construction starts for fiscal year 1960.

Although major appropriation bills such as this one aren't usually vetoed, President Eisenhower opposes the large number of proposed new starts. In fact, his budget message to Congress early this year, called for no new starts in fiscal '60. Deadline for his veto or signature was Aug. 29.

In reaching a compromise between the Senate and House versions, the conference committee deleted construction starts for several major-Senate recommended projects: Yellowtail Dam, Mont., Green Peter Reservoir, Ore., the Currecanti Project, Colo., and Melton Hill Dam in TVA territory.

$2.4 Million Slated for Trinity

The bill includes $2,415,000 to start federal construction of a 384-Mw power plant at Trinity Dam, Calif., as well as the following features: $500,000 to start work at Burns Creek Dam, Idaho (conditioned on authorization of the project by the House); $800,000 for federal transmission lines in western Iowa; $400,000 to study the Potomac River for water supply and pollution (multi-purpose studies were specifically exempted); $50,000 to start studies of the proposed $1-billion 5-million kw Rampart Dam on the Yukon River, Alaska; virtually unchanged appropriations for TVA, Bonneville Power Administration, and the Southeastern and Southwestern power administrations.

'Engineer' Due Next Month

Engineers Joint Council will publish the first issue of "Engineer," a newsletter, in September. Coverage will include national and international events affecting the engineer, as well as EJC activities.

Distribution will be free.

Revolving Fund for REA Stirs Hot Debate

Proponents say new bills could permit precise appropriations instead of estimates. Critics score the possible way-laying from the Treasury of some $3 billion in past loans

A White House-backed plan to create a $3-billion permanent revolving fund for the Rural Electrification Administration was handed to Congress last week. Bills incorporating the proposal were introduced by Sens Allen Ellender (D-La.) and George Aiken (R-Vt.) in the Senate, and by Rep Harold Cooley (D-N.C.) in the House.

These bills, referred to the Senate and House agriculture committees won't get any consideration this year, but they have stirred up strong opinions—both for and against.

Precise Loans Favored

• Acting Agriculture Secretary E. L. Peterson favors the legislation because it would permit Congress to appropriate for REA loans on a precise basis, rather than by the present method of appropriating funds for the coming fiscal year on an estimated basis. Under the plan, Congressional appropriations for loans would replace money taken out of the revolving fund during the previous fiscal year. If co-op loan re-payments to REA equalled requests for new loans, Congress would not need to make any appropriations for that particular year.

• Controversy is developing over the fact that the fund would be adaptable as a possible capital base on which a farm credit bank for co-ops could be established. Agriculture Secretary Ezra Taft Benson has urged creation of such a co-op-owned credit bank to eventually replace Congressional appropriations as a means of financing co-op construction.

• Criticism, however, has been leveled at two features of such legislation: **1.** All Congressional appropriations for past loans not repaid at the time of enactment would be caught up in the revolving fund. As such loans were repaid they would go into the fund—and would not be returned to the U. S. Treasury to meet prior obligations. At the present time, it's estimated that about $3.16-billion would come into the fund by this method. **2.** Congressional control over REA loan-making would be weakened because appropriations would be made "after the fact"—that is, after the loans had been made. Any questions would be elementary, opponents maintain.

Critics also feel that decreasing Congressional appropriations, as the revolving fund increased its ability to meet co-op loan requirements, might create an illusion of declining federal support for the rural electrification program.

The revolving fund would include all assets, liabilities and net investments of REA. Notes outstanding to the Treasury Department also would be liabilities of the fund. Balances in the fund could be used for new loans, administrative purposes, or for repayment on notes to the Treasury.

"However," Peterson wrote to Congressional leaders, "obligations for any of these purposes could only be incurred within limits prescribed by the Congress in annual appropriation acts."

Under the proposed bills, the entire REA budget would continue to be included in the Agriculture Department's annual report to Congress.

The White House proposal for REA is similar to three other bills, recently introduced in Congress, to establish revolving funds for the Bonneville, Southwestern and Southeastern power administrations.

No Link to Interest Rates

The present plan to create a revolving fund is not a substitute for two earlier Administration plans to hike the interest rates charged by the Treasury on notes of equivalent duration, and to authorize co-ops to "broaden their financial bases" by the issuing of their own revenue bonds.

Neither of these got to first base on Capitol Hill, and the Administration presumably is holding back further promotion of such legislation because of the rhubarbs the bills caused.

N.Y. Power Authority Starts 345-Kv Line

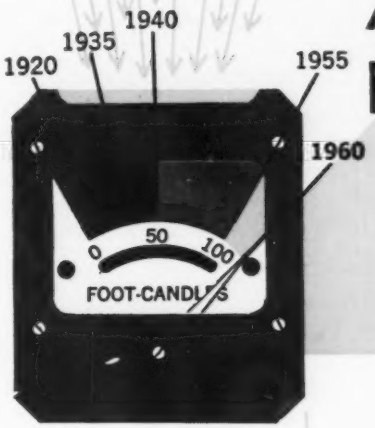
The first 345-kv transmission line in the East, part of the Power Authority of the State of New York's projected Niagara-St. Lawrence connection, was started last week. The 70-mile, single circuit, steel tower line will link the Niagara switchyard with a proposed substation south of Rochester, N. Y. Subsequent construction will include a 75-mile, 345-kv section from Rochester to Syracuse, and a 230-kv wood pole line from Syracuse to the Authority's Adirondack substation. An existing 230-kv Power Authority line links the Adirondack sub with the agency's St. Lawrence Power Project.

The construction contract for the Niagara-Rochester section, a $2,802,576 project, was awarded to Emerson-Garden Co, Inc on August 14. The line was designed by Uhl, Hall, and Rich. The 345-kv line will use bundled conductors, with two 795-Mcm conductors per phase, and have a 300-ft right-of-way. Because of the heavy industrial concentration at the Niagara Falls end, the first two miles of the line will have corrosion resistant conductors, ground wires, and hardware. Conductors will be strung with neoprene-lined double bull-wheel tension stringers.

The Niagara-Rochester section of the line is scheduled for completion by July 1, 1961. Bids for the Rochester-Syracuse link will be issued later this year. The entire project is expected to be completed by the summer of 1962.

Annual Lighting Progress Report:

New Lighting Levels—A $15 Billion Potential



JOHN D. DAMON, Commercial Editor

The most recent milestone in the progress of recommended lighting levels was reached last year with the release of what has become known as "The Blackwell Report." Lighting levels have traditionally doubled approximately every ten years and the Blackwell Report has extended this trend. But now for the first time electric utilities have at their disposal recommended foot-candle levels which are based on valid, scientific research, rather than some fact and some fancy. These findings have been accepted and published by the Illuminating Engineering Society.

In most cases the new levels are double the old; some are five times as much. Today, standard recommended levels for typical non-critical areas, according to IES, are 100 ft-c. In 1940 they were 50 ft-c.

And the future is limitless. Indeed, if these levels continue to double, the implications for the lighting business are staggering. George J. Taylor, president of IES, says the relighting market for both equipment and energy, based on the Blackwell levels, is worth over $15 billion.

And it is to this potential bonanza that Electrical World addresses itself in the next 15 pages.

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SECTION 1 UTILITIES PROMOTE NEW LIGHTING LEVELS

Utility Campaigns

Have electrical utilities throughout the nation accepted the new lighting levels recommended by the Blackwell Report? Are they promoting them? Do they feel they are adequate? Are they taking a greater interest in lighting since IES recommended new levels for most lighting installations?

To get the answers, Electrical World interviewed 51 utilities. The answer to most questions was a resounding "yes!"

Of all utilities checked only one said it wasn't recommending them in its service area. Three indicated they weren't promoting them one way or another. Most of the companies, when queried as to whether or not they were taking a greater interest in lighting because of the new levels, were taken aback at the question. "We've always had a great interest in lighting," they retorted. "We have always felt that lighting is one of our best markets for increased revenue,—every customer is a prospect," one large Eastern utility said.

"We believe the Blackwell studies have added new life to lighting," . . . "we feel the entire industry has been given a shot in the arm" . . . "the utilities have the most to gain, and the most to lose, depending upon how they act and react" . . . "no, but our customers are," were other interesting comments.

Do utilities feel the new lighting levels are adequate? Forty-one feel they are. A few feel they are too high, some think they are too low.

The majority opinion, however, was that they are adequate for present-day knowledge of lighting, and for available lighting fixtures. Said one top utility man, "Generally speaking, they are adequate for the types of equipment that are presently available. However, we believe that these levels should and will go higher than they are at present, but that will have to wait for equipment progress."

Why are some utilities not recommending higher levels? Financial status of their customers was one reason; high operating costs another. But all is not lost. Even those who haven't gone to the new levels have raised their sights. Said one utility, "In some instances we have not been able to sell our customers on using new levels in their entirety, but invariably we have raised the levels higher than would otherwise have been installed."

How are utilities promoting these new levels? Direct mail pieces and personal contacts seem to be the answers when utilities want to get these new levels to their customers. Other key ways to sell the new high levels are new promotion programs centered around the standards; lighting courses and

PORTLAND G&E uses office lighting demonstration kit

METROPOLITAN EDISON kit promotes display lighting

meetings to instruct sales personnel and allies on how to "sell up" to the new levels; insisting on the recommended levels in all lighting plans; and distributing reprints of the new levels. A couple of utilities sponsor tours of installations they have sold which employ high-level lighting.

Here are some of the highlights of the best promotions:

"We operate an all-service selling policy in which lighting is promoted on every call," says J. L. Beaver, commercial sales manager of Pennsylvania Electric Co and Metropolitan Edison Co. Following a plan of calling on "markets by class of business, each commercial sales representative is responsible for calling on 1,500-1,800 customers. Markets include: Service stations, food stores, food service operations, and apparel and accessory stores.

Special booklets, "Ideas To Make More Money" are given to each store owner. On each call, the commercial representative analyzes and makes recommendations for lighting improvements. Demonstrations and "use the user visits" help close the sales which are made by cooperating dealers. The lighting demonstrations were quickly made with a suitcase type lighting kit. (See photo, top right.)

Pennsylvania Electric recorded 668 lighting demonstrations and Metropolitan Edison 252. Penelec gave 48 talks attended by 1,688 people, and Met Ed reports 25 talks with 938 people attending.

Consolidated Edison Co of New York has had a commercial lighting promotion designed to reach approximately 5,000 retail store merchants in its Brooklyn area. Color post cards showing examples of good sign, window, interior, and specialty lighting installations in four stores were mailed to storekeepers. During the course of the mailings, each store was called on at least once by a Con Ed business representative with an offer of a lighting study by the company's Lighting Division. A return of 10% requests for lighting recommendations resulted.

Pennsylvania Power & Light Co has had seven big recent lighting campaigns. Throughout the year, the company sales representatives plan and promote "Light for Living" prescriptions utilizing a company-prepared planning guide. Homes meeting PP&L's prescriptions are company inspected and certified.

Homes With Lighting Standards Total 57%

This activity was initiated in 1955. The first year, 4.9% of the single-family dwellings completed met the requirements for Prescribed Home Lighting. In contrast, 57% of the single-family homes completed during the first half of 1959 met these standards.

A total of 20 lighting workshops were conducted to educate PP&L's sales allies and company business sales personnel on the advantages of high level lighting for commercial and industrial establishments.

A 3-month "Hi-Fi Commercial and Industrial Lighting Campaign," designed to produce "record sales" in commercial and industrial lighting applications and to test PP&L lighting specialists as salesmen, sold 537 jobs, with an estimated EAR of $545,362.

Kansas Power & Light Co is getting more commercial lighting because it is going after it. The number of good lighting jobs sold went up 50% in 1958 over '57, and kwhr increased 35% over '57. The sales activity, built on a "Cold Turkey" theme,

required all salespeople to send in at least one commercial lighting lead a week to a specialist in the general office. The lighting specialists then developed lighting layouts and went out to sell the customer.

After one good lighting job was installed, the firm, an oil company, was so pleased with the results it said that it would relight three other stations.

Connecticut Light & Power Co went after the big commercial lighting market with a 2-month Supermarket Lighting Campaign.

Dinner meetings presented the story of lighting and the new lighting levels to owners and operators of food stores. Slide lectures and display booths visually demonstrated the difference between old and new lighting recommendations for stores. Portable stands were available for on-the-spot demonstrations of individual display highlighting.

Direct mail piece was a letter with a dime attached telling the store owner that improved lighting would make his products displayed stand out and make the people buy. It pointed out that if the customer picked up just one additional 10¢ item for every $4.00 he normally spends, the customer would pay for 200 ft-c of lighting.

"Operation Nighthawk," was a Western Massachusetts Electric Co campaign aimed at selling window lighting at night. The campaign helped store owners attract new customers, made stores more attractive, and made competitors pale by comparison, according to the company.

Postcard Notes Unlighted Stores

The promotional gimmick was to mail a postcard to store owners stating that a power company representative had passed the store at a certain time in the evening and found the store window unlighted. It then pointed out that for 2.9¢ the window could be lighted all night. One caution: Before making notes on unlighted stores, be sure and notify the police what you are going to do. One power company man was picked up on suspicion early in the campaign.

Portland General Electric Co has an office lighting demonstrator which it shows to school boards, city councils, PTA groups, service organizations, chambers of commerce, business and industrial firms and the like. The program, in effect more than eight years, is constantly upgraded as new techniques and materials become available.

The $5,000 model, one-quarter scale, includes interchangeable floors, walls, ceilings, furniture, and several different lighting systems. It was built by PGE shops under the lighting department's direction and is carried to location by a specially equipped route van truck. Each meeting brings from 10 to 15 inquiries for lighting surveys.

Commercial sales engineers at the Georgia Power Co are competing for $25 monthly gift certificate prizes in the "Lighting Job of the Month" contest. Entries consist of a brief description of the job plus a lighting layout.

LUMINOUS BACKGROUNDS are promoted at Detroit Edison

Jobs are judged on: IES standards, innovations, completeness—did the engineer just design in the standard minimum lighting, or did he include extra sign outlets?—emphasis on lighting, and other lighting that will do a better job.

A Golden Anniversary Lighting Sales Promotion sparked this year's lighting activity at Northern States Power Co. It is based on giving the electrical contractor credit for those installations which meet minimum present-day ft-c or wattage requirements. Five months totals show 3,930.37 kw and $209,-048.20 EAR added.

A sub-promotion, as part of the all-industry lighting promotion, was a store lighting promotion using a direct mailer and hand-out pieces on store lighting to be used by NSP commercial sales representatives on follow-up calls. Lighting load achieved was 43.7 kw and 55 future lighting prospects were uncovered.

Some of Union Electric Co's lighting activities include:

1. Builder programs which promote residential lighting to the speculative builder. A builders' tour to Nela Park and a builders forum on lighting demonstrate how good lighting will help sell their homes.

2. Field Service Section saleswomen call on homes to demonstrate lighting. The saleswoman asks the customer to sit at her favorite reading lamp. The saleswoman then turns on the lamp, asks the customer to notice how easy it is to read with the lamp, and also takes a ft-c measurement to show the customer the amount of light she is receiving. Then the UE representative changes the bulb in the lamp to a 200-w silica-coated bulb. She again has the customer read, and takes a second ft-c reading. She always leaves the 200-w bulb and urges the customer to increase her lighting throughout the house.

During 1958, Philadelphia Electric Co promoted the sale of lighting through home lighting specialists who survey homes to recommend lighting improvements. Nearly 2,000 calls were responsible for an estimated 697.7 kw, and a $13,954 EAR.

A Fall Lighting Campaign, in cooperation with the

IOWA P&L'S Lamp Liter Shop boosts residential sales

STORE FRONT promotion by Western Mass resulted in this job

Electrical Assn of Philadelphia, was aimed at selling planned lighting jobs in the commercial, industrial and exterior fields. Lighting equipment manufacturers, lamp companies, distributors and contractors, and utility personnel helped sell 3,802 lighting jobs in a 10-week period. Sales of fixtures amounted to $4,430,442, a new record for the annual activity.

A "Light Work" commercial lighting campaign produced 1,004 kw of additional lighting load for Kansas Gas & Electric Co in three months. Primary objective was to create more and better lighting installations in existing buildings. Each commercial representative was assigned a minimum quota of 40 kw of added lighting load.

KG&E pointed out to their salesmen there was a market for relighting jobs if they found: A classroom with less than 70 ft-c; an ordinary business office with less than 100 ft-c; an accounting, bookkeeping, or business machine operation with less than 200 ft-c; a service-type retail store with less than 100 ft-c on merchandise, 200 in the show and wall cases, and 500 on feature displays; and a self-service type retail store with less than 200 ft-c on merchandise, 500 in show cases, and 1,000 on feature displays.

Detroit Edison Co's major lighting activity has been a Lighting Workshop for contractors, architects consulting engineers and distributor salesmen "interested in improving their lighting knowledge." Purpose: To provide a refresher in lighting calculations; present new light sources, show new techniques in application and how to design lighting systems to meet the new IES levels.

Plans for 1960 include a 200 ft-c sales promotion effort to sell one 200 ft-c installation in each district.

Commercial lighting has played a big part in West Penn Power Co's 1959 lighting activities. A 3-month campaign this spring collected $247,000 in EAR, 46% of the company's annual quota. Thirty-four high-level lighting jobs were sold or installed, and 12 of these met IES recommendations.

A commercial-industrial conference was also held to discuss the high level lighting systems and the new recommendations. New levels were brought to the attention of 66,000 lighting users through publications and direct mail advertising. All pieces carried illustrations of high-level lighting installations.

Public Service Electric & Gas Co has found customer meetings to be successful as load builders, for educating the customer on the new lighting standards, and improving relations between customers, allies, and the utility.

Good, high-level lighting in merchandising and as an aid to "downtown" shopping areas to beat suburban center competition are presented at business association meetings by Public Service.

Schools Get Lighting Story

Baltimore Gas & Electric Co has found educational institutions are an excellent place to promote lighting. A local university incorporated lighting and wiring in its course, "The House, Its Planning, Building and Construction"; the Maryland Institute School of Interior received talks on better planned lighting, and student nurses at a Baltimore hospital, during the part of their training dealing with sight, are given the "Light for Living" Story.

Washington Water Power Co hit all four lighting markets this year. A two-day forum, in cooperation with the local IES chapter, presented office and school lighting, light for selling, production lighting, lighting and architecture, and the new IES levels.

Tampa Electric Co has lighting specialists constantly calling on architects, builders, engineers, store owners, and other regarding better lighting. In two concentrated campaigns, an all-out dealer cooperative light bulb campaign resulted in the sale of 146, 925 bulbs to 119, 440 residential customers, or 1.23 bulbs per customer.

Cleveland Electric Illuminating is producing a color, sound film, "Profit and Light" to promote store and office lighting. The film will feature new and interesting lighting installations, many with lighting intensities higher than those recommended by IES.

Utility Offices

The credo of any good salesman is to know and have faith in your product and use it before you go out to sell it to anyone else.

Utility companies, faced with selling the findings of the Blackwell Report to their customers, have done just that.

Before they even began sales campaigns to get commercial establishments to raise their lighting levels, the power companies installed high-level lighting right in their own offices.

Consolidated Edison Co of New York has equipped nine of its executive offices with fixtures which provide nine stages of lighting, ranging up to 450 ft-c. The installation has been used many times in selling architects, engineers, builders, and others on the benefits of high-level lighting.

EXECUTIVE OFFICE at Indianapolis P&L boasts 250 ft-c

WASHINGTON WATER Power gives employees 160 ft-c

C. Wesley Meytrott, Con Ed vice president, whose office is one of those lighted to high levels, says, "Office lighting of 50 ft-c is as outmoded as the Model T Ford."

Niagara Mohawk Power Co not only has lighted one of its offices (a 500 ft-c job in its Western Division) but is going on the road to push office lighting. An office lighting display booth with 250-275 ft-c is being exhibited at business shows and company district offices in upper New York.

Commercial representatives in the districts bring their lighting prospects in to view the display to stimulate their interest in better office lighting. This has resulted in "worthwhile prospects for office lighting jobs," according to the company.

"We feel that a certain amount of our success in the promotion of better lighting is due to demonstration of the lighting in our new Illuminating Building quarters," says Frank A. Zender, manager, commercial sales department of Cleveland Electric Illuminating Co. "Our office lighting ranges from 125 to 450 ft-c," he notes.

Detroit Ed Sells Lighting With Tours

Nineteen offices at the Detroit Edison Co's general office building have been planned with lighting levels ranging from 75 to 125 ft-c. Tours are arranged for architects, engineers, contractors, and customers to see first-hand the benefits of higher lighting levels.

The Framingham office of Boston Edison Co was completely relighted even before the Blackwell Report came out. It was designed to maintain a ft-c level of 100 plus. Result: This installation has already sold four other 100 plus ft-c jobs in the immediate vicinity.

Omaha Public Power District points with pride to its Electric Building which has an arcade between its glass-walled showrooms lighted to an average of 350 ft-c. The same basic pattern used in the arcade, but with less powerful lamps, produces 250 ft-c inside.

In St. Louis the private office of M. E. Skinner, vice president and director of sales at Union Electric Co, used to be lighted to between 20 and 25 ft-c. Relighting raised these levels to 145 ft-c.

Executive lighting for efficient management is exemplified by an office installation at Indianapolis Power & Light Co.

The office was designed by the company's commercial lighting division not only to provide an office of great flexibility but as a "laboratory for better seeing."

Lighting in the entire sales department exceeds current lighting levels. A variety of lighting units have been installed providing the company's lighting engineers with a working showroom where a customer's lighting problem can be worked out.

Lighting in the offices of Washington Water Power Co has ft-c levels varying between 150 and 190.

Illinois Power Co recently remodeled its commercial office building. The entire first floor was lighted to IES standards and its luminous ceiling maintains about 160 ft-c. The manager's office has about 300.

Tampa Electric Co has lighted its office building to a maintained illumination of 100 ft-c, and uses it as a show place for the members of the electrical profession.

Jobs sold from this building include an FHA building lighted to 100 ft-c, and numerous smaller office buildings and offices lighted to 100 to 150 ft-c.

Other utilities following suit include Alabama Power Co which has a division office with from 100 to 400 ft-c; Dayton Power & Light Co which has an office lighted to 175 ft-c; and Kansas Gas & Electric Co which is lighting a division office building to exceed all minimum IES levels.

Industry-Wide Campaigns

The electric utilities are not alone in promoting good lighting. There are many industry groups providing solid backing with all-industry campaigns which have the same objective: To make the American worker and consumer aware of what excellent illumination can do for them.

When Edison Electric Institute formulated its National Electric Living Program last year, one of the three key phases was lighting. The campaign is now solidly underway.

Biggest aspect right now is a $100,000 Consumers' Contest in which grand prizes will be four Light for Living Medallion Homes based on winning designs in the spring student architects' contest.

Prime promotion piece of the Light for Living kit is a 17-page lighting booklet containing information on how to live better electrically in a Light for Living home. The booklet covers lighting for atmosphere and accent; light for living in the kitchen, the living, and dining areas; light for living lamps; light control; bathroom lighting; outdoor lighting; and light for safety and convenience.

Member utility companies are getting a promotional package which can be used locally to tie-in with the national promotion, and the American Home Lighting Institute is cooperating with mailings to its manufacturer and distributor members who plan to tie in retail outlets with the consumer contest.

The Eye-Fidelity Lighting Program of the National Lighting Bureau is another industry program that is backing the push to higher lighting levels.

The purpose of the program is to encourage sales of quality installations of industrial and commercial lighting (with emphasis on relighting) through strong promotional activities.

A national advertising program is carried on in general business magazines, merchandising magazines, and industrial magazines, as well as the electrical trade press. Current ads are highlighted by this slogan: "When you limit their sight with inadequate light, *you* lose." Headlines are geared for specific types of readership. Merchandising magazines have, "No See—No Sale!" and industrial magazine ads are using, "Dim Outlook for Output!"

The Academy of Lighting Arts, conceived two years ago by the General Electric Co, is rapidly picking up members. The Academy was formed to train specialists in all phases of residential lighting through the sponsorship of local utility companies.

Among those taking the courses are electrical contractors, electrical distributors, lighting fixture dealers and manufacturers, and decorators.

Forty utilities, so far, are conducting courses.

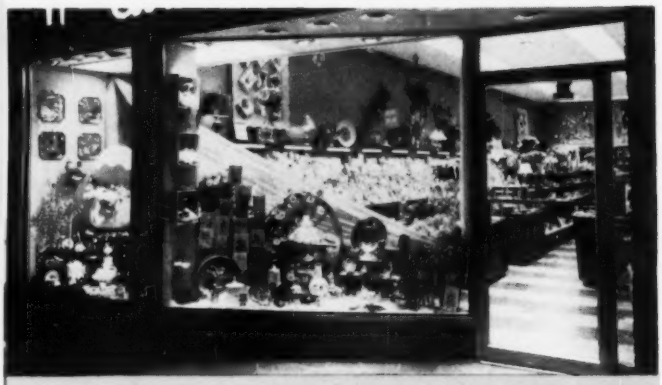
Other organizations utilities should look to for help in pushing the new lighting levels include:

- Better Light Better Sight Bureau for school lighting
- Farm Better Electrically (EEI) for farm lighting
- Westinghouse Electric Corp's Total Electric Home Program, for residential lighting.

SECTION 2

THE PROMOTION PAYS OFF...

Display Lighting



CARD SHOP served by Boston Edison has 100 plus ft-c

SHOE STORE has good highlighting and luminous wall

AUTO SHOWROOM has 500-1,000 ft-c on car grille work

Modernization of retail outlets is now extensively required, according to Sales Management magazine. "This is being done in many cases with excellent results, but largely by chain firms, and only about ¼ of the nation's 23,000 stores are members of chains. Shopping where there is attractive color and light and a feeling of enjoyment and adventure is irresistible . . ."

Utilities across the nation, cognizant of these facts, and armed with the new IES recommendations have attacked the enemy—the remarkably poor lighting in the commercial establishments throughout the country.

High-level lighting in Cleveland Electric Illuminating Co's territory includes:

An office with 230 ft-c of general office lighting with luminous ceilings; 150 ft-c in another general office area; 150 ft-c of general lighting at several Royal Castle restaurants in Cleveland; and a shoe store with 120 ft-c of general lighting.

Birmingham Museum Has 300 Ft-c

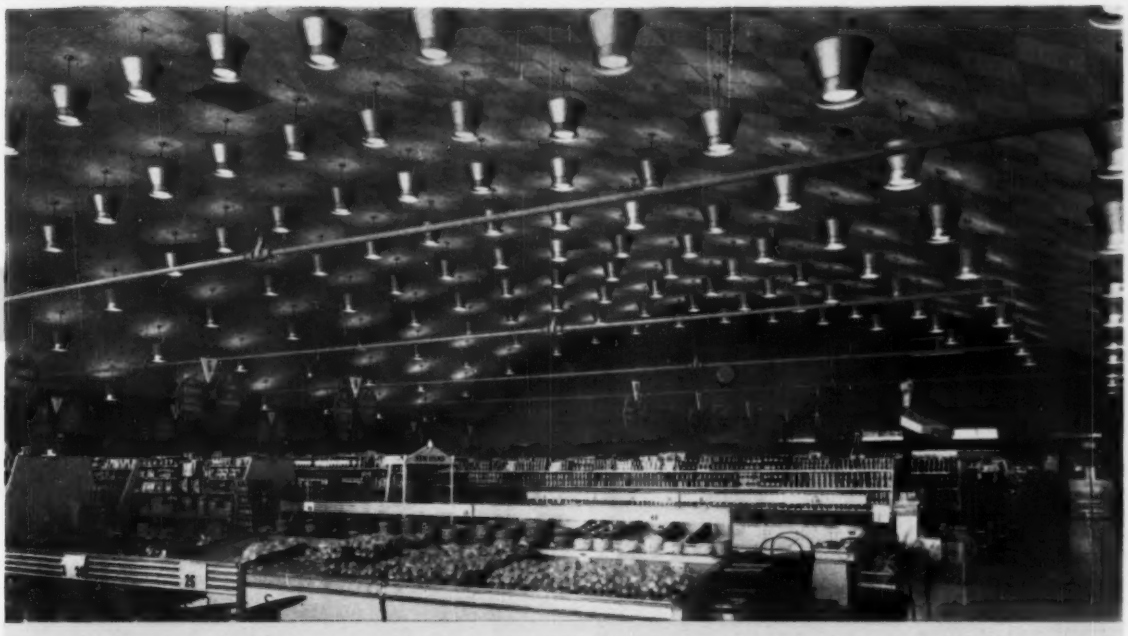
Alabama Power Co reports a bank in Birmingham has 100-150 ft-c; the Birmingham Museum of Art has 75-300 ft-c, well over the IES minimums; an attorney's office has 130 ft-c; and a store in a secondary business area has 130. In the Montgomery area, a drug store has 100 ft-c in the general sales area, and a bank has as high as 120 ft-c.

Ohio Power Co reports its most recent customer installation is a 150-ft-c job in a bank in Malta. The company is proud of it because, in addition to being a high-level job, it replaces one that provided 10 ft-c.

Detroit Edison Co has scored a coup: The automobile manufacturers have accepted recommendations from the utility on lighting for automobile show rooms, and are including this data in their nationally distributed dealer facilities guide.

A film strip has also been prepared by the company. This 25-minute presentation is a pioneering effort to develop creative thinking and to help stimulate better lighting designs of stores in their area, according to Detroit Ed.

A Detroit firm of architects and engineers has relighted all its executive offices and drafting rooms with intensities ranging from 100-150 ft-c. The offices are used to show clients how they can utilize various lighting elements and benefit from the new higher intensity illumination.



CLEVELAND SUPERMARKET has 125 ft-c of excellent lighting which also provides 80% of the heat

Utah Power & Light Co is proud of Wangsgard Market in Ogden where lighting gives an average of 100 ft-c in the sales area.

The owner says enthusiastically, "We have always believed in good lighting and thought we had a good lighting job in the old store. But now when we go into other stores, with lighting equal to our former place, we wonder why they are so dark . . ."

Southern California Edison Co has these installations in its service area which equal or exceed IES recommendations: A law office with luminous glass ceiling lighting of 150 ft-c; a medical office with 105 ft-c of semi-indirect quality office lighting; and a home which has a kitchen area where lighting levels go as high as 85 ft-c, and levels of 50 and 100 ft-c over the entire master bath and powder room.

The Pitcairn Co in Jenkintown, Pa., served by Philadelphia Electric Co, has an accounting office where good color conditioning of ceiling, sidewalls, floor and desks help to maintain 175 ft-c. The private executive office has lighting levels from 50 to 200 ft-c. The reception area is lighted with a wall-to-wall luminous element with a switching control which provides either 150 or 175 ft-c of low brightness comfortable lighting.

A Boston Edison installation is a card shop in Framingham, Mass (see photo, p 68). The store was a new one and the owner was shown a 100 plus ft-c job in the local Boston Ed office. After seeing it, he told his building owners that he wouldn't be satisfied with less.

Although the wattage in his shop is twice as much as originally planned, he said he has no regrets. His venture has proved very profitable to him—no small part of the credit is due to the drawing power of good lighting. He now intends to change a liquor store he runs to higher levels.

Since customers were shifting to suburban shopping centers, the owners of the seven M&W markets in southwestern Idaho built their new stores in shopping centers. But their ace in the hole was good lighting to attract customers.

General level throughout the sales areas is 100 ft-c. A built-in music system operates during store hours to minimize possible fixture noise.

The owners emphasize that good lighting and electrical equipment are very valuable sales aids.

Sacramento Municipal Utility District has one office installation which increased illumination from 18 to 90 ft-c in the sales office and 8 to 100 in the conference room. Another company has 50 ft-c in the reception room and 60 in the office, (a rise from 10 in the first case and 14 in the latter).

WWP Has 170 Ft-c Installation

Washington Water Power Co has one 170 ft-c installation in the office of a mining company. New Jersey Power & Light Co-Jersey Central Power & Light Co have lighting installations at Bell Telephone Laboratories which reach 150 and 230 ft-c.

Public Service Electric & Gas Co is proud of: A banking area illuminated to 225 ft-c, and three different stores with 100 ft-c of general lighting and greater values at counter sales points.

Baltimore Gas & Electric Co, a merchandising utility, has 280 ft-c in one of its company appliance stores. The "ceiling of light" was installed to demonstrate the desirability of high intensity lighting without objectionable brightness.

Schools

Up to a few years ago, schools in this country were used mostly in the daytime. Occasionally, they were used at night but this was mostly for discussion-type meetings.

Now, with the advent of adult education and other increased community activities, the classrooms must be properly lighted at night, as well as in the daytime.

Utilities, aware of this trend, are going after the school lighting market.

Authorities agree that the basic utilitarian light can best be supplied by manufactured light with daylight functioning to provide variation and change in the visual picture.

While there is lagging in some parts of the country, the nation's schools are generally very well lighted, and, according to some authorities, school lighting has been ahead of other areas in installing high-level lighting.

Jack R. Clemens, business manager for the Youngstown, O., public schools says, "It is our studied opinion that lighting in school buildings is the most important single factor in the maintenance and supervision of the school plan. More depends upon it for the welfare of the youngsters and the teachers than any other single factor."

There seems to be however some difference of opinion among utilities. Some utilities who said they were recommending the new lighting levels put in one qualification: All except for schools. State minimums are 30 ft-c in their areas; IES recommends 70. These utilities said they are compromising at 50 ft-c.

However, other utilities have had a good deal of success in installing high-level lighting in schools.

UNIVERSITY LAW library was increased from 11 to 115 ft-c

SPECIAL LABORATORY lighting provides up to 600 ft-c

Southern California Edison Co has two schools in its service area with 80 ft-c, and another goes to 70.

Pennsylvania Power & Light Co annually organizes a trip to Nela Park for school officials, architects, and engineers to help promote better school lighting. Continued contact with these allies has resulted, in the past five years, in a 220% increase in the number of classrooms lighted to the new recommended standards.

PP&L has also prepared a School Lighting Maintenance Program for presentation to school maintenance and custodian personnel.

Portland General Electric Co has had a classroom rehabilitation program which covered 2,000 classrooms and added $10,000 in annual revenue. It also upgraded Portland schools to help qualify Oregon for the best lighted schools in the nation.

Pacific Gas & Electric Co has one new school which has 70 ft-c on all reading surfaces.

Texas Power & Light Co has a school with a maintained ft-c level from 70 to 75, while San Diego Gas & Electric Co has a school with a maximum of 122 ft-c at desk tops, a minimum of 86 and an average of 101.

Other high-level school installations include:

- A school in St. Louis with 85 ft-c.
- One in Massachusetts lighted to 115 ft-c through the use of a large luminous elements composed of 4-ft square louvered panels.
- An installation in California with a maintained level of 65 to 70 ft-c. This is increased to 135 ft-c with the addition of daylight.
- An Ohio school using luminous panels on 10x10-ft centers in the art and music room with an average illumination of 90 ft-c.

Yard Lighting

The electrical utilities, who have had a corner on the lighting market for a long time, were jolted recently when a form of lighting which had disappeared with floor-length skirts and the horse and buggy came back. Gas lights reappeared on the American scene.

But the utilities were concerned only momentarily. They immediately came up with a phenomenon of their own—electric yard lights.

The utilities who have promoted them have found them to be a great advertisement for the electrical way of life.

"Don't think for a minute we aren't interested in getting this business," said one utility man. "One post lantern means, to us, approximately 300 kwhr per year."

Although yard lights cannot be classified under the category of higher lighting levels, they are a new entry onto the electrical scene just as high-level lighting. And yard lights, just as promotion of increased illumination, are helping to call attention to the many useful benefits of electricity.

Pacific Power & Light Co has just completed a yard light promotion. In a 2-month period they sold 1,031 photocell-controlled "Friendship Lanterns" to home builders, existing customers and employees, and presented 54 lanterns to home builders whose homes met Medallion Home specifications.

In a Kansas Gas & Electric Co promotion, Karl Wise sold 242 Friendship Lanterns.

Dallas Power & Light Co first introduced its "Ready-Lite" on April 1. By the end of May it had sold 1,000 of them.

UTILITIES ARE stepping up yard light promotion

Oklahoma Gas & Electric Co's promotion resulted in over 1,300 lights sold by company employees.

Other utilities participating in this new revenue builder and attention-getter include: Pennsylvania Power & Light Co, Mississippi Power & Light Co; West Penn Power Co; Utah Power & Light Co; Central Power & Light Co; Kansas Power & Light Co; Public Service Co of Oklahoma; and Appalachian Power Co.

SEVERAL INSTALLATIONS in one Washington state neighborhood show yard lighting is catching on

Building Illumination

The promotion and publication of the new lighting levels hit home to one group closely concerned with the necessity for excellent lighting. And they translated their concern into action.

The nation's building owners and operators, architects and engineers, under the aegis of the Building Research Institute, gathered in Cleveland recently for a Building Illumination Conference. Purpose: To find out how the new lighting levels will affect building design and engineering.

What they found was that practically all the problems can be solved, and the new higher levels are going to mean increased business for them.

Henry L. Logan, vice president-research, Holophane Co Inc., noted that human bodies respond so favorably as lighting levels go up, and people feel such refreshing certainty in their perceptions, orientation and actions, that they will continue to adopt higher levels as fast as they can afford to.

For higher levels there will be a tendency to wider use of the more highly loaded lamps: the Power Groove, the very high output, and the high output types; and color-corrected mercury, he said.

The advantage of the most highly loaded fluorescent lamps, and the color-corrected mercury lamps, is that they pack more wattage and more lumens than the standard fluorescent lamps. "All things being equal that means less wiring and equipment for high-level lighting and so less costs," Logan commented.

NEW YORK'S 666 Building gets up to 10 ft-c of spot lighting

"In our concern with the design, construction, and maintenance of buildings we know that one of the first questions asked about any new idea is, how much is it going to cost?" said Robert A. Nevin of Sargent-Webster-Crenshaw & Folley.

He feels the new levels are going to cost more money, but sees these developments as solutions to holding down cost increase: New and improved light sources and control equipment; some compensating trends in the cost of lighting equipment; the new square fluorescent lamp and electroluminescent cell; well-engineered equipment having high utilization of the source output; and good maintenance practices.

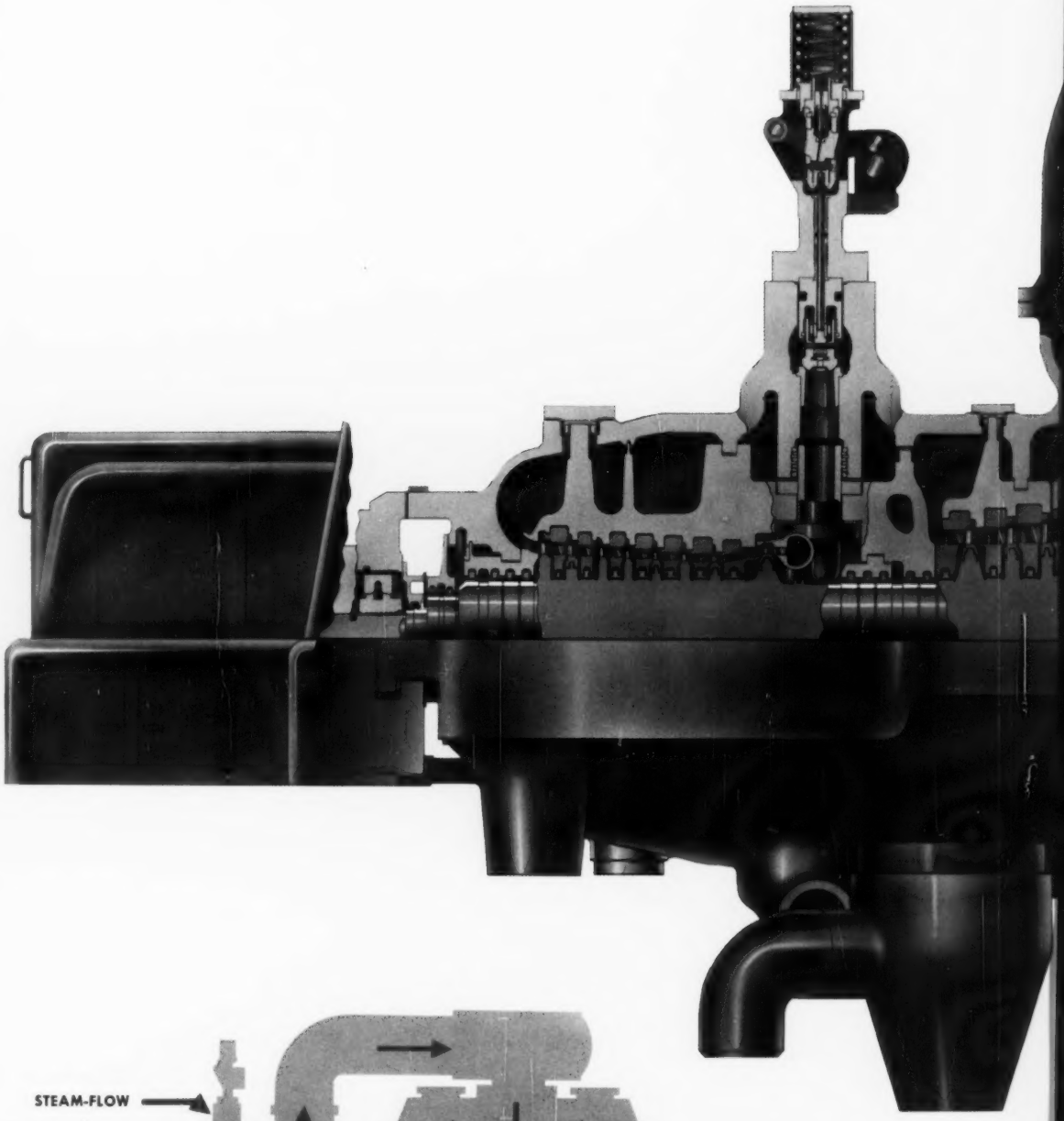
And, he says, improvement in lighting will result in more effective output by workers, and building owners, vitally interested in systems that will provide the services required by their tenants, will adopt these new levels quickly and eagerly.

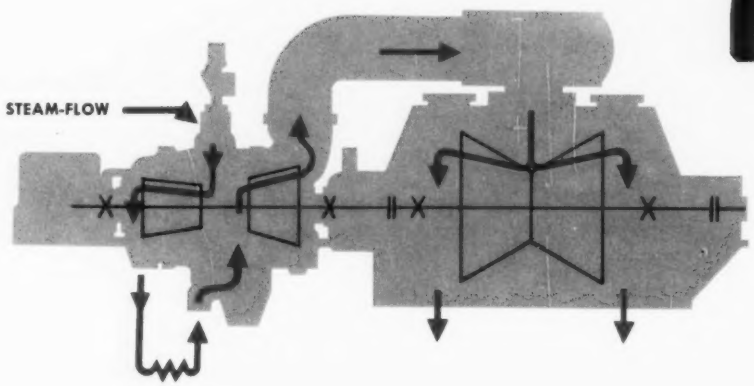
"The new levels of illumination will create challenging problems for the air conditioning engineer," said Edward J. Benesch, chief engineer, Syska & Hennessy, Inc. But they can be solved, he said.

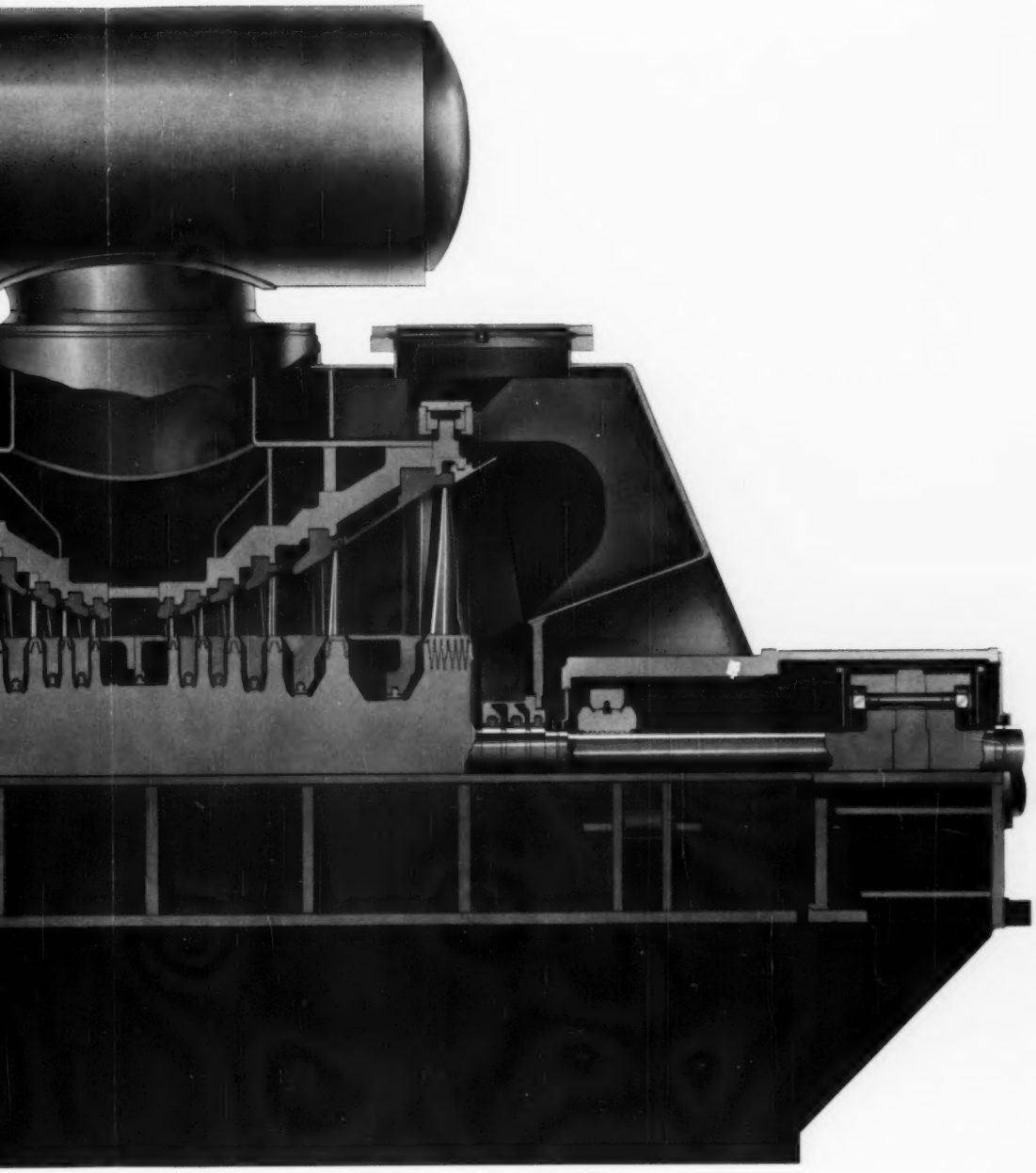
In order to coordinate the air conditioning with the lighting, means should be provided to remove the heat of the lamps and ballasts directly at the source. This means would be either a ventilated fixture or a cooling panel. Noise will not be a serious problem because of the number of lighting fixtures in the spaces; ballast noise can be taken care of by grouping of ballasts in an area where the noise they create may not be too important, Benesch said.

DAY AND NIGHT showcase is accomplished with high-level lighting

NEW BUCKET DESIGN
for steam turbines . . .
increases ratings, simplifies arrangements
The new 29-inch, last-stage bucket makes possible a further advancement in turbine design—the capacity of General Electric's well-established 3600-rpm, tandem-compound, double-flow, reheat steam turbine can now be raised to the 175,000—225,000-kw range. This new concept in bucket design helps improve turbine heat rate and increases power without increasing turbine size or complexity. Inherent G-E bucket standards—high-efficiency, low-vibration characteristics, and long-life qualities—are maintained.
Characteristics of the advance are:
• increased annulus area over the previously longest 3600-rpm last-stage bucket;
• efficient aerodynamic profile;
• rugged, nested pin-and-finger dovetail construction; and
• improved bucket material.
Continuous new developments, such as this bucket design, are making it possible for General Electric to pre-engineer steam turbines for the '60's. On the following pages are more design features that help improve heat rate, increase reliability, and extend ratings of the time-proven power maker—the tandem-compound, double-flow, reheat steam turbine.
GENERAL ELECTRIC

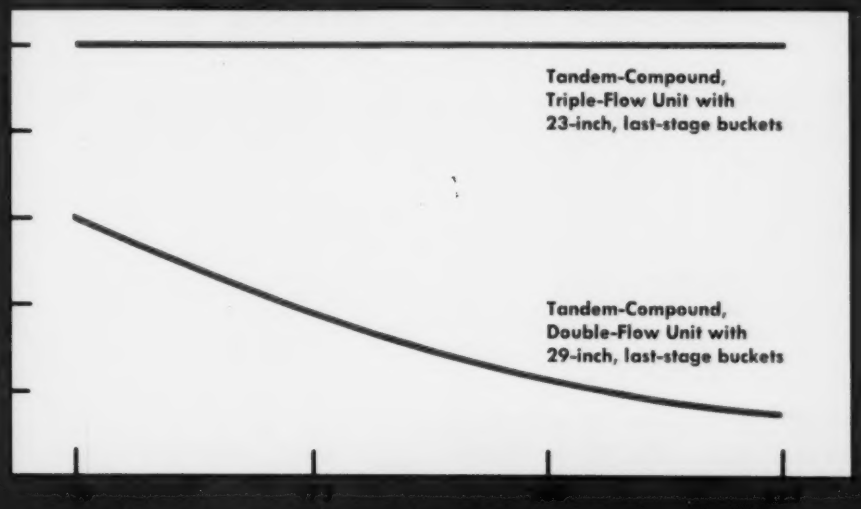


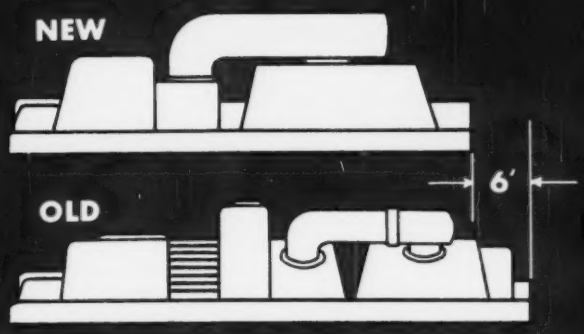

STEAM-FLOW



3600-rpm, tandem-compound,
double-flow, reheat steam turbine

GENERAL ELECTRIC





MORE POWER,
LESS SPACE,
IMPROVED ECONOMY

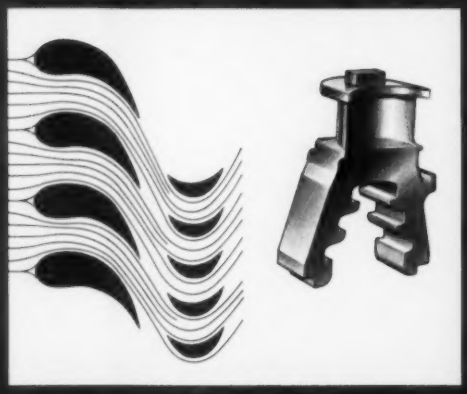
Simplified Design Helps Improve Turbine Economy for the '60's

Inherent simplicity and ruggedness of construction have helped establish the basic double-flow design as a standard concept. Now General Electric's newly designed 3600-rpm, tandem-compound, double-flow, reheat steam turbine, with 29-inch, last-stage buckets – in addition to being more compact with improved heat rate – is adding emphasis to:

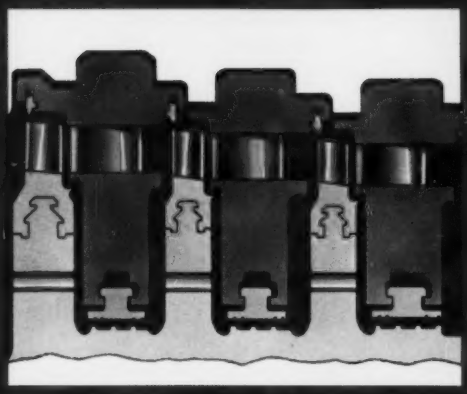
- **Smoother operation**—two bearings per rotor span allowing independent balancing, vibration isolation between spans, and shorter front standard;
- **Reliability**—intercept valves close to reheat inlets for controlled overspeed, thrust bearing in middle bearing housing for better balance of bucket-to-nozzle clearances;
- **Accessibility**—one-piece lower and upper half-shell construction, single crossover;
- **Ease of assembly and disassembly**—one less turbine rotor, one less cast steel shell, fewer bearings, packings, and couplings.

This is another of General Electric's pre-engineered turbines for the '60's – turbines which can help you meet ever-increasing power demands. For more information on any of General Electric's large steam turbine-generators, contact your nearest General Electric Apparatus Sales Office. 254-79

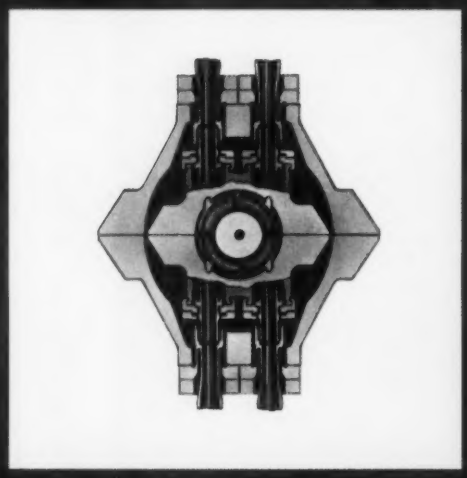
GENERAL ELECTRIC



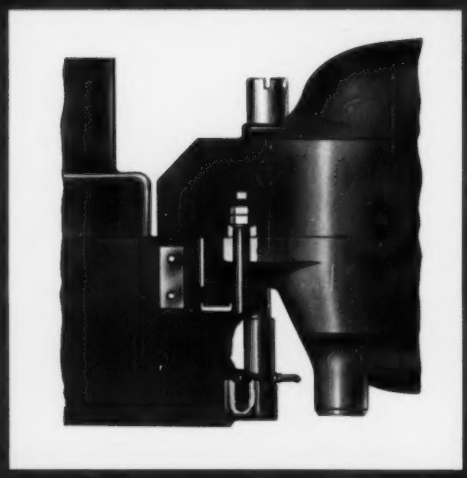
IMPULSE-TYPE STEAM PATH,
RUGGED BUCKET DESIGNS



REMOVABLE RADIAL SPILL STRIPS,
SPRING-BACKED SHAFT PACKING



NOZZLE BOX CONSTRUCTION



TRUE CENTER-LINE SUPPORT

These Important Evaluation Features of General Electric Pre-engineered Steam Turbines Mean...

- Minimized Investment
- Improved Performance
- Simplified Operation
- Greater Reliability
- Increased Availability
- Accelerated Installation
- Reduced Maintenance
- Extended Life

Progress Is Our Most Important Product

GENERAL ELECTRIC

Dual-Ratio Units Cut Conversion Cost

Transformers with externally operated ratio adjuster save $15 per unit in converting to 7.62/13.2 kv. Three primary coils hold copper losses to guaranteed values

H. C. BINGHAM, Supervising Distribution Engineer, Cleveland Electric Illuminating Co., Cleveland, Ohio

Initial savings of $15 per transformer will accrue to Cleveland Electric Illuminating Co through the use of dual-ratio transformers in converting low-load density areas from 4,800 v to 7.62/13.2-kv, multi-ground distribution. Savings per dual-ratio unit will become more than $78 per conversion when transformers are used in second and third locations. Three primary coils in the dual-ratio transformers, as proposed by CEI, will allow use of the units at full nameplate rating at either 4,800 v or 7,260 v, with losses falling within the 7,260-v guaranteed values.

Change Voltage Twice

Conversion to 7.62/13.2-kv marks the second time CEI has raised its distribution voltage. To meet growing loads during the last 30 years, the company has been converting from 2,400 v to 4,800 v ungrounded delta, using dual-ratio transformers with internal taps. This move is practically completed. Conversion to 7.62/13.2-kv involves transformer and equipment replacement, as well as addition of a neutral wire.

To handle transformer replacement, four plans, and the primary consideration in each, were evaluated:

1. Replace 4,800-v with 7,620-v transformers on cutover day. Although this operation can be carried on in cold weather, analysis showed that this plan would require too long a service outage.

2. Lower the 4.8-kv transformer and secondary temporarily and install a 7.62-kv unit, with the 4.8-kv transformer to be removed later. This scheme permits grounding the 7.62-kv transformer case and its secondary neutral when installed. Remaining secondary and primary connections are made at conversion date on this transformer, when all connections are removed on the 4.8-kv transformer.

This plan involves the expense of three "pole climbs" on separate days. In some cases it will be necessary to replace the pole to permit lowering one transformer. In other cases an adjacent pole can be used for the new transformer. With this latter plan, four pole climbs are needed, but the lowering is not necessary.

3. Replace the existing transformer with a dual-ratio unit with internal taps. In this plan a 10-kv lightning arrester and an open-type cutout are installed, but on the phase which will be grounded on conversion day a 6-kv arrester and an enclosed cutout are used. The enclosed cutout is used to show that the transformer is still working at 4.8 kv.

Experience during the earlier

(*Continued on page* 82)

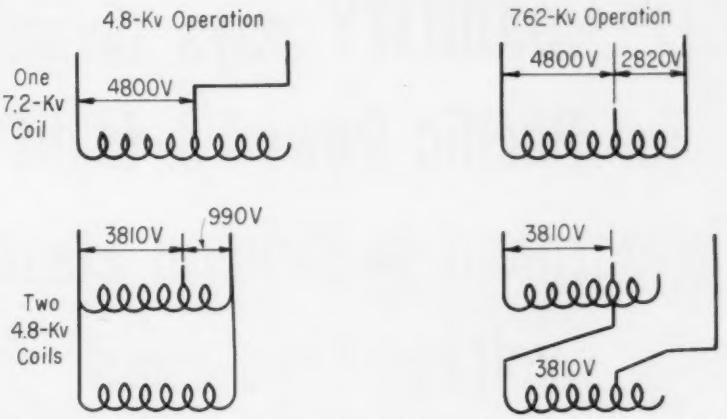


FIG 1—COPPER LOSSES INCREASE when all turns in the primary coils of a dual-ratio 4.8/7.62-kv transformer are not used. With a 7.62-kv coil tapped at 4.8 kv, losses are high for 4.8-kv operation. When two 4.8-kv coils are used, tapped at 3,810 v, higher losses result at 7.62 kv

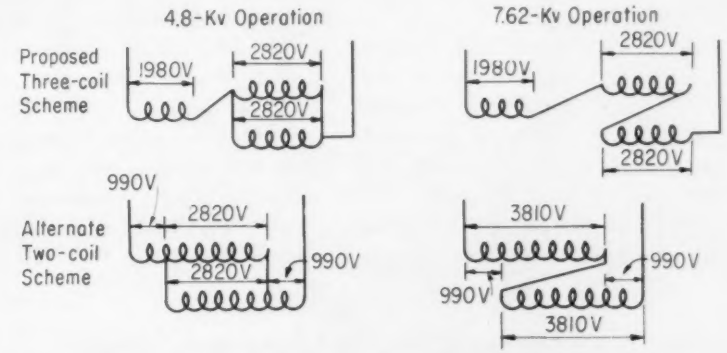


FIG 2—LOSSES AT NAMEPLATE RATING are within values guaranteed at the higher voltage (7.62 kv) when all turns in three coils are continuously used. If the 1,980-v coil is two wire sizes larger than the other coils, total copper loss is about the same for both connections

THE MAN WHO HAS TO KNOW,
J. COLEMAN JONES, GENERAL SUPERINTENDENT,
TELLS WHY . . .

DEPENDABILITY pays dividends for Pacific Power & Light's investment in General Electric voltage regulators

"We use many General Electric three-phase step regulators for efficient system voltage control at the substation. Over the years, General Electric MLT-32 regulators have paid us dividends in dependable performance."

Dependability means highly-reliable equipment operation with least-possible maintenance. General Electric controlled speed switching results in fast-break, slow-make tap changes for minimum contact wear and prolonged regulator life. Hydraulic dashpots and redesigned Geneva gears reduce switching noise.

GENERAL ELECTRIC REGULATORS COST LESS ON THE LINE because you get continuing Extra Dividends . . . from **G-E DEPENDABILITY**—absolute minimum maintenance; in **G-E SERVICE**—routine or emergency; from **G-E RESEARCH**—superior regulating equipment. Result: Extra values = **LOWER COSTS.**

Only General Electric returns so much for your regulator investment. Ask your General Electric regulator representative to show you how. General Electric Co., Schenectady 5, New York. 423-39

Progress Is Our Most Important Product

GENERAL ELECTRIC

conversion program showed that cutovers can be handled only during good weather, a factor that complicates scheduling of cutovers.

4. Replace the existing transformer with a dual-ratio transformer with an externally-operated ratio adjuster. This plan appeared the most reasonable, if the additional cost of the unit could be justified economically.

Cost Studies Revised

On the basis of the above, it was decided to compare Plan 4 with Plan 2 to determine the economic advantage of the former. In converting the low-load density areas, CEI's need is for 10, 15, and 25-kva sizes, the mean size being 15 kva. Economic studies of the two plans were completed in 1958. However, in April, 1959, transformer prices were reduced—the reduction on single-bushing, single-ratio 7,620-v units being greater than on dual-ratio, 4,800x7,620-v, double-bushing transformers — so the cost studies were revised to agree with the new prices. Results of analyzing the two plans are given in the table.

In the comparison, common material costs were omitted. Extra cost of a 15-kva dual-ratio, double-bushing transformer over a single-bushing 7.62/13.2-kv transformer has been included. Labor costs include direct labor, first-line supervision (foreman), cartage, and stock handling, but not general overhead costs.

CEI changes about one-eighth of its transformers each year. On this basis, the average dual-ratio transformer will be available for additional conversion operations probably twice more in the next 16 to 18 years. The dual-ratio extra cost of $55 need not be applied on the second and third conversions, so that the saving becomes $70 each for these conversions.

With the cost of money at 6½%, the present worth of the savings, excluding overhead costs, in favor of the double-ratio transformer becomes:

Initial savings	$15
Present worth of $70 saved in nine years	39
Present worth of $70 saved in 17 years	24
Present value of future savings	$78

Changeover to 7.62/13.2-kv will be in the faster growing low-load density areas, and the general overhead costs have not been included in the above calculations. Thus, CEI will save considerably more than $78 per dual-ratio transformer acquired for conversion.

The company is installing a double-ratio transformer with cutout and arrester suitable for 7.62-kv operation on one phase wire, and 4.8-kv equipment on the other phase wire where any new transformer is required in areas planned for conversion to 13.2 kv within three years. It cut over two circuits to the higher voltage during 1958, interruption of service to customers lasting from 11 to 36 min. The company plans 11 new 13.2-kv circuits during 1959.

In discussing the possibilities of 4.8x7.62/13.2-kv wye-120/240-v distribution transformers with various manufacturers, the company learned that 2.4x7.2-kv transformers are used in Chicago and elsewhere. Such transformers have three coils, each rated at 2.4 kv hooked in series or parallel as shown in Fig 1. For its 4.8x7.62-kv needs, CEI was told that designs could be within the 7.62-kv guaranteed losses at 7.62 kv but that losses would be higher at full load at 4.8 kv. The company was advised to accept 80% rating for the transformers operated at 4.8 kv.

CEI proposed that three coils be so used that all turns were continuously included as shown in Fig 2. For the ratio desired, this arrangement would have two coils, each designed for 2,820 v, connected in series or parallel. In either case, the coils would be in series with a 1,980-v coil. Voltage would total either 4,800 or 7,620 v. If the 1,980-v coil is of conductor two wire sizes larger than the other coils, total copper loss would be about the same at full load for either connection.

Several Possibilities Exist

This 4,800-v and 7,620-v combination could be worked out in another way, with two 3,810-v windings, each tapped at 990-v, and properly connected. Suppliers agreed that CEI could have dual-ratio transformers with full nameplate rating at either voltage, losses being within the 7,620-v guaranteed values.

Of externally-operated switching schemes offered or under development, none is expected to give trouble due to oil or air entering the tank.

Suppliers who had experience with O-ring seals on secondary breaker handles felt that the externally-operable switch would not make much difference in the price of the transformer.

CEI believes that the direction of rotation for raising the primary operating voltage should be standardized on the transformers of various manufacturers. They suggested that clockwise rotation was desirable on the CEI system.

Analysis Shows Dual-Ratio Unit Saves $15

PLAN 2—Install 7.62-kv transformer on 4.8-kv transformer pole		
Step 1 Lower existing transformer and secondary, and install 7.62-kv transformer and equipment, labor	$110	
Step 2 Reconnect on conversion day, labor	12	
Step 3 Remove 4.8-kv equipment, labor	40	
Total		$162
PLAN 4—Replace 4.8-kv with 7.62-kv dual-ratio transformer		
Step 1 Dual-ratio transformer, extra cost	$55	
labor	80	
Step 2 Reconnect on conversion day, labor	12	
Total		$147
Saving with dual-ratio transformer		$15

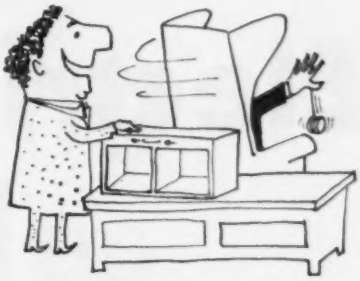
HOW "FILAMENT PHIL" FINALLY LANDED THE DIMBULB ACCOUNT

with the amazing new G-E See-Level Comparator . . . lighting sales tool . . .

PHIL: Scared? Me scared of Old Man Dimbulb? Ya darned right! I've waited two years to see that guy!

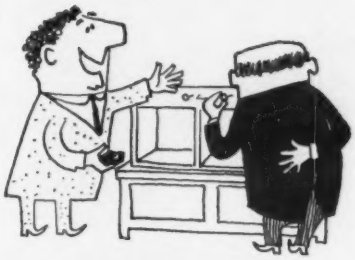
PHIL: Morning, Mr. Dimbulb. I'd like to show you . . .

MR. DIMBULB: Make it snappy. I'm a busy man.



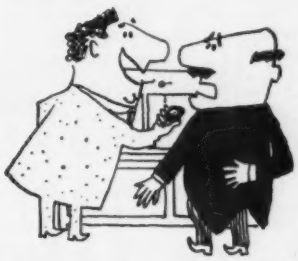
PHIL: This is a General Electric "See-Level Comparator". Sorta makes a game out of lighting.

MR. DIMBULB: Got no time for games.



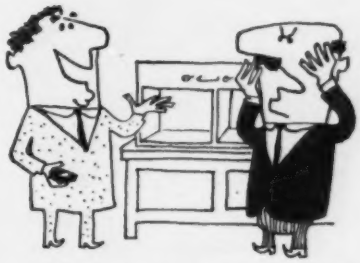
PHIL: I put one of your own company's widgets in here. Now YOU work this little knob 'till you get the light you think your employees need.

MR. DIMBULB: Hmmph. Don't want too much light. 'Bout there.



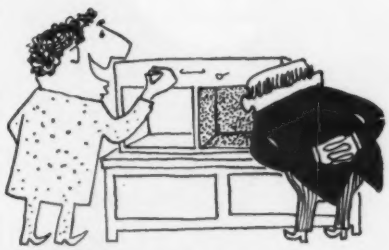
PHIL: Let's see—you picked 950 footcandles!

MR. DIMBULB: (horrified) 950! Good heavens—what do we have in the plant?



PHIL: (proudly) I checked. It's 30.

MR. DIMBULB: (astonished) 30?!



PHIL: There's how your 30 footcandles look. But, here's what you should have.

MR. DIMBULB: Amazing, Phillip. We must do something about this quickly!

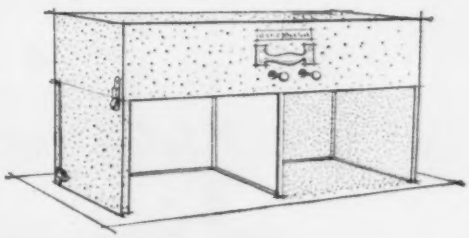
PHIL: Wow! A 200 footcandle lighting system! What a day!

MRS. PHIL: Phil, honey—this li'l ole box says our house needs a lot more light. Look how nice my pots and pans look in this side.

G-E "SEE-LEVEL COMPARATOR" HELPS SELL HIGHER LIGHTING LEVELS

Makes Higher Lighting Levels Understandable, Desirable, Salable!

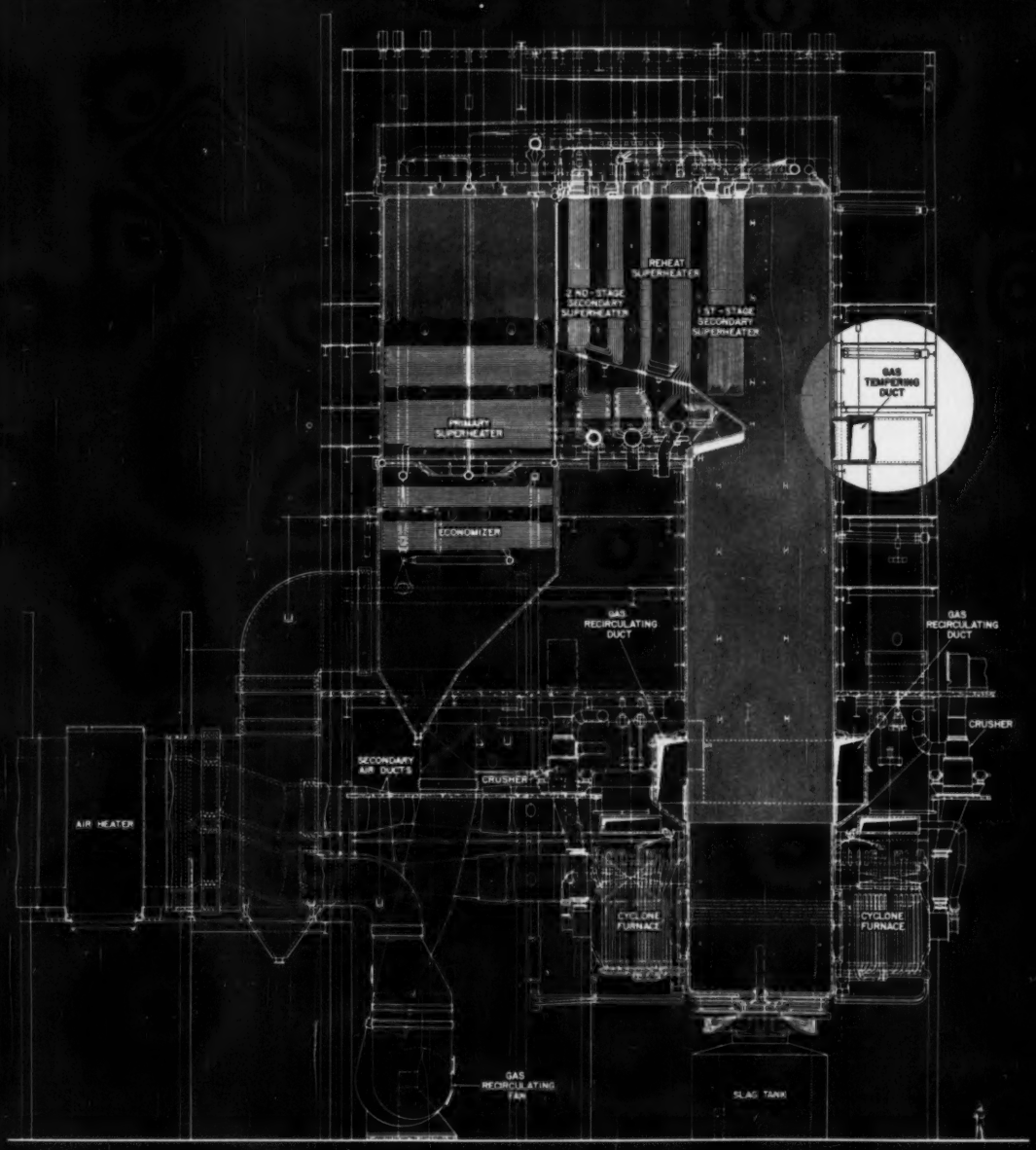
AMAZING PORTABLE SALES TOOL—About the size and weight of a packed two-suiter . . . sets up side-by-side comparisons in less than a minute . . . demonstrates up to 1400 footcandles. Increase your profits . . . sell higher lighting levels easier. Just $100, plus shipping charges, and it'll pay for itself with the first extra job it helps you sell. Write for illustrated booklet: General Electric Co., Large Lamp Dept. L-110, Nela Park, Cleveland 12, Ohio.



GENERAL ELECTRIC

Gas Tempering: **Report No. 2**

Electric Utilities Find Points Way to



B&W Cyclone Furnace Universal Pressure Boiler.
Coal is the primary fuel with oil as an auxiliary fuel.

Gas Tempering Fuel Economies

...Lets You Burn The Most Economical Fuel Available— Coal, Oil or Gas

Gas Tempering—is the reintroduction of cool flue gases near the furnace outlet to control the temperature of the gases entering the convection surface. It is the practical means to help you burn the most economical, most easily available fuel.

Gas Tempering enables you to burn a variety of coals without slagging.

It minimizes external corrosion of superheater tubes. It reduces metal temperature, cuts need for high alloys, prolongs tube life, regardless of the fuel burned.

In effect, gas tempering allows you to adjust the size of your furnace to meet the characteristics of the fuel. This is done by varying the amount of tempering to chill the furnace exit gases to a temperature known to be satisfactory for the fuel burned. The gases are cooled but the total heat available to the superheater remains the same.

That's Why with Gas Tempering, you no longer need to pass up attractively-priced fuels.

Definitive Booklet: If you'd like to learn more about the economies and design flexibility available to you through Gas Tempering, write for Bulletin G-96. Address: The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

Major Advantages of B&W Gas Tempering

. . . It cuts overall plant costs because the smaller size unit requires a smaller building per kw, a lighter foundation, less structural steel and shorter steam leads.

. . . It enables you to utilize the most economical available fuels. It permits the burning of a variety of coals without slagging, minimizes external corrosion of superheater tubes, and assures safe metal temperature, thus prolonging tube life, regardless of the fuel fired.

. . . It provides safe superheater tube temperature by positive gas temperature control; it protects superheater during startup and under all operating conditions.

. . . It makes it safer to design for economies offered by operation at steam temperatures of 1050 F and above.

B&W

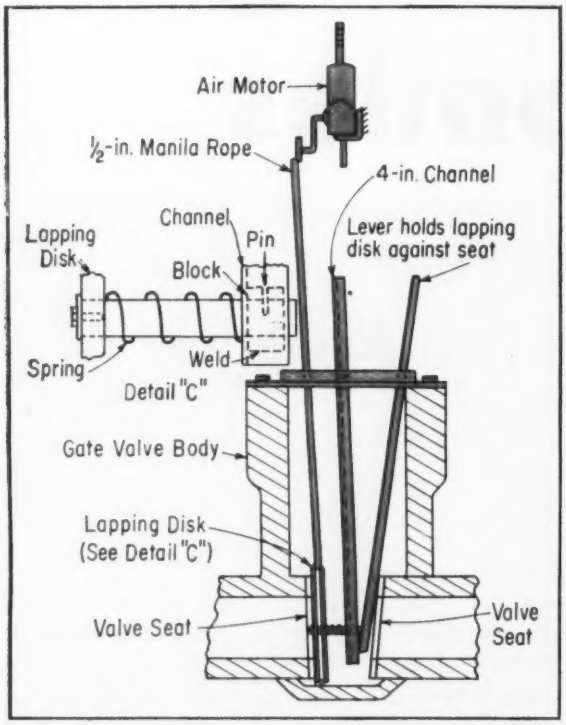
THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

G-934

Jig Laps Gate Valve Seat Rings

J. C. **GRAHAM**, Maintenance Man, Tidd Plant,
T. E. **GOOSMAN**, Master Maintenance Man, Ohio Power Co, Brilliant, Ohio



A special jig is used by Ohio Power Co personnel to lap warped seat rings on 10-in. boiler stop valves. Without the jig, a valve must be cut from the line, sent to the factory, and later welded into place.

A cast iron lapping disk (11 in. diameter, 1 in. thick) has a groove in its periphery for a ½-in. rope drive. The disk turns freely on a 1-in. shaft pinned in a steel block that is welded to a 3½-ft long section of 4-in. channel. Pressure on the lapping disk is regulated by a spring around the shaft and pressure of a lever against the lapping-disk support.

The rope is attached to a stationary spring and to the crank arm of an air motor. It rotates the lapping disk through a 180-deg arc with an oscillating motion. Two 2-in. angle irons fastened across the top of the open valve body hold the pivoted support of the lapping disk while it is rotated by the rope drive and pressed against the valve by the lever.

Construction of the jig and its use to lap both seats of a 10-in. valve required 36 hr, considerably less time than that required to remove the valve.

◀ **CAST IRON LAPPING DISK** held against valve-seat ring is given an oscillating motion by a rope fastened to an air motor at one end and to a spring at the other

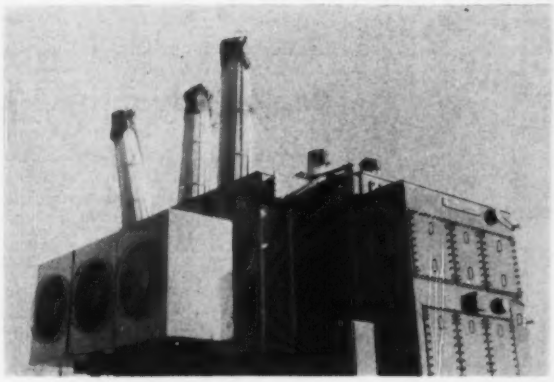
Wooden Covers Protect Bushings

R. C. **SCARLETT**, Station Supervisor, Kingsport Utilities, Inc, Kingsport, Tenn.

Strips of wood, tied together to form wrap-around covers, protect transformer bushings for Kingsport Utilities, Inc, during station construction and maintenance. The covers can save the time and cost of replacing a damaged bushing.

To make the protective covers, several pieces of sash cord or rope are stapled across enough wooden slats to enclose the bushing. Slats, cut from 1x3-in. boards, should be slightly longer than the bushing to protect the ends. Heavy building paper also tied over the ends adds protection.

The small space between slats provides flexibility



for installing, handling and storing the covers. Cost per cover varies from $3 to $5, depending on bushing size and number of covers made at one time.

(*More Methods on page* 89)

The culmination of 15 years of research on the protection of transformer tanks and covers from

water, ice, smog, sun, salt spray and wind

NOW...
Pennsylvania Transformer proudly introduces
THE NEW

V.I.P.*

FINISH
for all Pole Star Distribution Transformers and Regulators

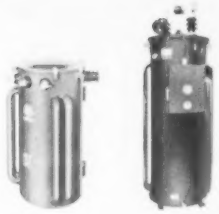
*Vinyl with Inner Phosphate

V.I.P. ...is not just a preparation...is not just a paint
...is an ALL NEW FINISH that will double the tank protection of your transformer IN ALL LOCATIONS

Pennsylvania POLE STAR **Distribution Transformers and Regulators**

PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON COMPANY, CANONSBURG, PA.

Turn page for V.I.P. details



Here is what V.I.P. Finish does for your transformer and regulator tanks:

V.I.P FINISH

Pretreats tank surfaces to resist corrosion
Prevents spread of rust if scratches occur in handling
Provides extra high resistance to moisture, alkali, acids
Protects against incipient corrosion at edges, corners
Produces high-gloss finish that long retains its luster

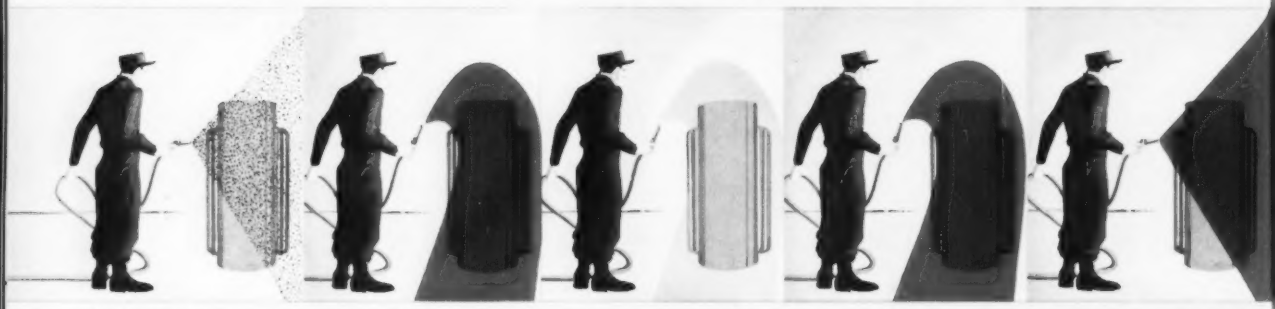
The new V.I.P. Finish for Pole Star Distribution Transformers and Regulators is *more* than a paint. Basically a *vinyl* finish with an *inner phosphate* coating, V.I.P. Finish gains its outstanding characteristics from careful preparation and pretreatment of the metal, followed by meticulously controlled application of the various coats.

A principal reason for the amazing weatherability of V.I.P. Finish is that it provides not only extra-high *primary* resistance to moisture, alkali and acids . . . but also sets up a secondary or insurance barrier that prevents the spread of corrosion if any bare metal becomes exposed, as in the case of accidental scratching. Such spots can be touched up with complete assurance that no underfilm corrosion will occur.

V.I.P. Finish is designed to save maintenance costs, even when transformers and regulators are exposed to the most highly corrosive atmospheres. Tests prove this. To take advantage of new V.I.P. Finish on your next distribution transformers or regulators, contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

McGRAW EDISON

THIS IS THE 5-STEP V.I.P. PROCESS THAT PROVIDES ALL-WEATHER, ALL-CLIMATE PROTECTION FOR POLE STAR DISTRIBUTION TRANSFORMERS AND REGULATORS



1. In the first step, all exterior surfaces of the tank—made of copper-bearing, corrosion-resistant steel—are shot-blasted with steel grit. This removes all scale, grease and dirt, and also provides "toothage" for adhesion of the first coat to the steel surface.

2. A combination chemical pretreatment and primer applied by the flow method simultaneously form a phosphate coat and thin organic film on the clean metal. This is the V.I.P. step that prevents the spread of corrosion, even if the metal is scraped bare in spots.

3. A tough vinyl combines with non-leafing aluminum to form an almost impenetrable surface against moisture or moisture vapor.

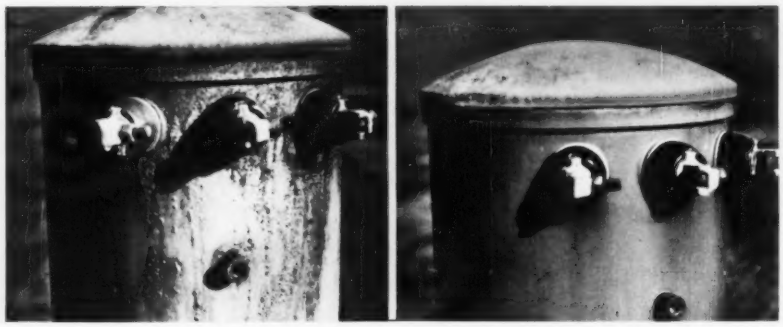
4. An alkyd-titanium paint (used successfully on Pole Star transformers for many years) is flowed on to provide a heavy uniform coverage.

5. A final spray coat of blue-gray alkyd-titanium paint assures a smooth finish with a maximum gloss. This, together with the preceding coat, forms a hard, elastic finish that resists weathering.

The V.I.P. Finish provides a total thickness of 3 to 4 mils for extra heavy protection. All coats are oven dried at controlled temperatures.

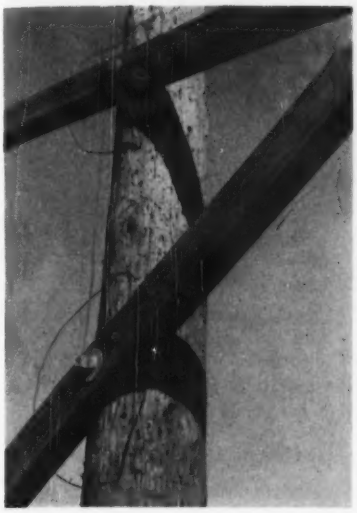
LIFE TESTS AND ACCELERATED TESTS SHOW SUPERIORITY OF NEW V.I.P. FINISH

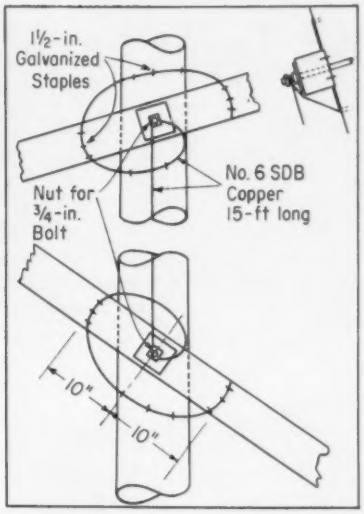
Both transformers shown here were exposed for 2500 hours in a salt spray cabinet, then were placed outdoors in an industrial atmosphere for 2½ years. The transformer protected with V.I.P. Finish (on the right) shows hardly any effect from its ordeal, whereas the other transformer—which started with a good finish by previous standards—is badly corroded.



Pennsylvania POLE STAR Distribution Transformers and Regulators

Lead Wires Prevent Crossarm Fires





COPPER LEADS bypass leakage current to stop burning on 69-kv line. Staples are driven to hold leads firmly against the maximum surface on pole and arms

F. C. HELWIG, Estimating and Service Engineer, Toledo Edison Co, Toledo, Ohio

Incidence of crossarm fires on 69-kv pole lines on the Toledo Edison Co system has been cut by installing copper leads to bypass leakage current. The wire was installed on wishbone-arm structures with suspension insulator configurations which were subject to the burning hazard.

A loop of No. 6 soft drawn copper wire was stapled to the crossarms and the pole and then looped around the through bolts under an auxiliary nut, bonding the bolts together.

Work was done with the lines energized using only ordinary safety precautions. A 5-man crew included two linemen, a groundman, a driver and a foreman. The proper length of wire was sent up to the linemen in a small coil and was uncoiled while stapling it down. Costs ran about $18 for single-arm structures and $22 for double-arm structures.

The line was built in 1942. Although poles are on railroad rights-of-way and pass near industrial plants, contamination does not appear to be acute. The original inspection, however, showed signs of "tree burning" in varying degrees on 18 of 70 structures.

Burning occurred only on suspension insulator structures, where the insulators are made from four 5 x 10-in. disks. No signs of burning occurred on structures where insulators were in the strain position. Strain insulators are made of five similar 5 x 10-in. disks, and this, coupled with the better self-washing of strain insulators, accounts for the lack of burns on strain insulator installations.

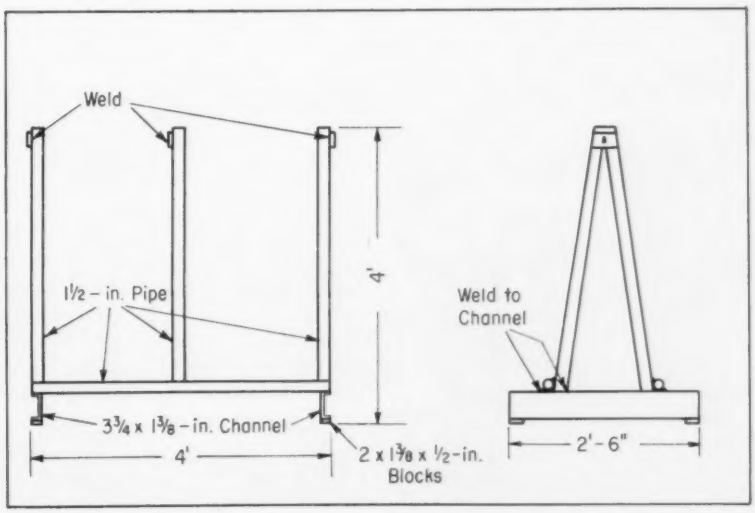
For the first 10 months during which the installation was in service, weather conditions of heavy fog, mist and wet snow occurred. These are similar to existing conditions during previous fires, but there has been no recurrence of burning.

Store Wire on Special Pallet

Coils of wire are easily handled and stored using a special pallet developed by Worcester County (Mass.) Electric Co personnel.

The special pallet is made from sections of 1½-in. steel pipe and 3¾x1⅜-in. channel sections. Components are joined by welding.

Four ½x1⅜x2-in. blocks are welded to the ends of the bottom channel sections to provide skid surfaces.



Turbine Oils Need Top Characteristics

Turbine oils must exhibit a number of important characteristics to be entrusted with protection of the steadily larger units appearing on generating systems.

Foremost among the necessary qualities is resistance to foaming. Air is always picked up as oil flows in an agitated state through the bearings. If an oil has good nonfoaming characteristics, entrained air will be more readily released while the mixture becomes quiescent in the system reservoir. An oil with excessive foaming tendencies can also cause overflow from the reservoir breather system and possibly a turbine shutdown.

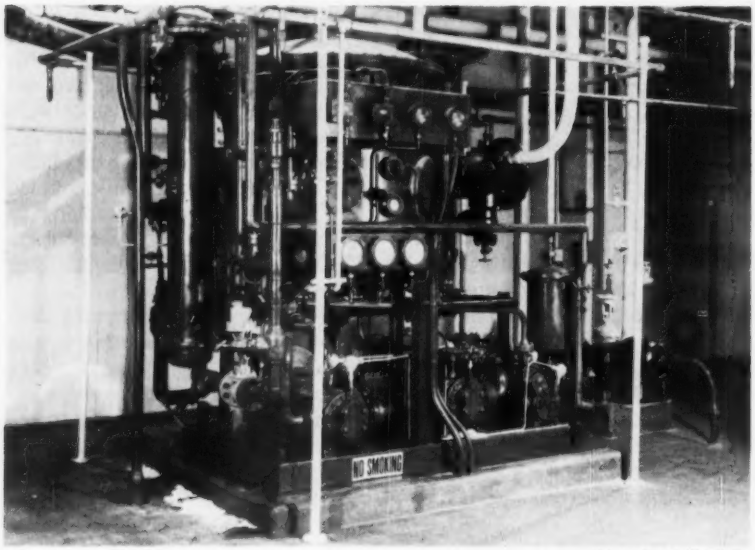


Photo by Gulf Oil Co

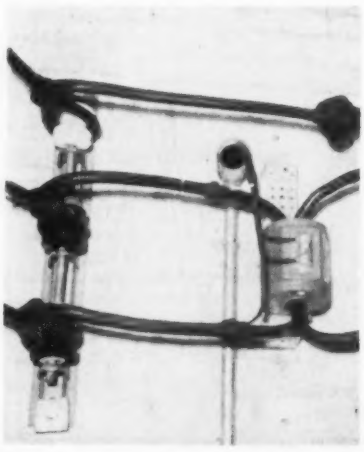
HYDROGEN DETRAINING equipment at New York State Electric & Gas Co's Milliken Station is an example of the effort necessary to keep turbine oil pure

Of equal importance with nonfoaming characteristics is the oil's resistance to oxidation. When an oil oxidizes it becomes acidic. Acidic products of deterioration can form sludge, which may seriously interfere with flow characteristics of the turbine lubricating system.

Another important characteristic of a turbine oil is its ability to protect metal components of the system and governor mechanisms against rust. Minute particles of rust can cause serious malfunctioning of the governor system if they form on or become entrained in the close clearances of pilot valves in the governing system. Larger amounts of rust may also cause damage by interruption of oil flow to main bearings.

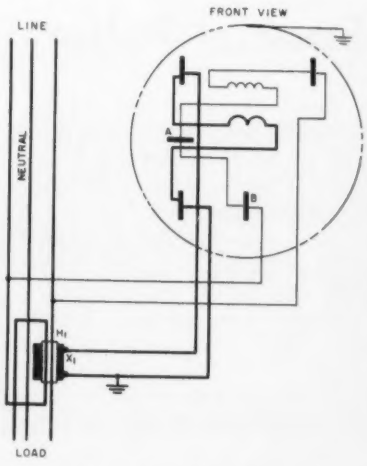
Steam turbine design is such that water is inherently present in varying degrees in the turbine lubricating oil system. Consequently, it is essential that a modern turbine oil contain a corrosion inhibitor to protect metal surfaces against rust.

A good oil must separate readily from water. Even though the corrosion inhibitor will protect against rust, the presence of water is undesirable because it can form oil-water emulsions that may interrupt oil flow to the bearings. A turbine oil should readily release water when quiescent in the reservoir.



Meter Scheme Cuts Costs

To meter single-phase 120/240-v residential customers having demands greater than 20 kw, Duke Power Co uses a single-element 5-amp 240-v meter and a single current transformer. Both hot legs of the service are run through the CT to add the currents. Use of this metering scheme saves about $40 over the alternative of using a two-element meter and two CT's.



DOSSERT MICON*

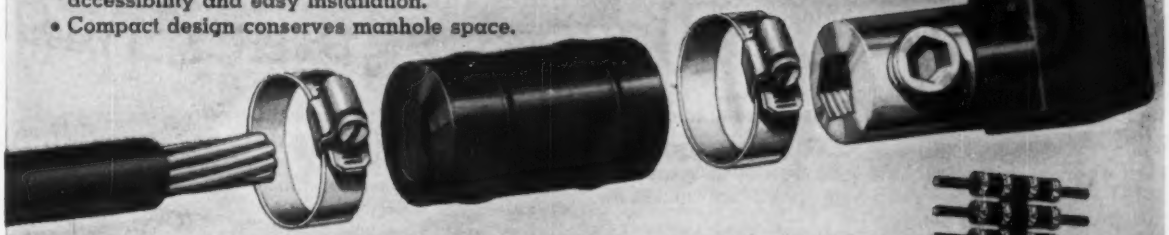
(Tapeless Underground Connector)

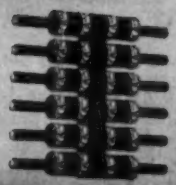
More COMPACT
More RELIABLE
LOWER in COST

MICON is a Dossert Mfg. Corp. trademark for a tapeless underground connector especially designed for residential and industrial underground distribution systems. This brand of connector is fully insulated for joining up to 8 electrical cables where watertightness must be insured. MICON tapeless connector is simple in concept and well proven principles have been used in its design. No extra components are needed to accommodate a wide range of cable sizes in any outlet position.

MICON brand tapeless connector has many outstanding features and advantages which constitute a substantial improvement over older style and competitive fittings. The most important ones are:

- Lower cost of complete fitting.
- Less field time required for installation.
- Wide cable range without accessories.
- No plastic parts to crack or chip.
- No extra bushings required to fit different insulations.
- All parts are designed for easy accessibility and easy installation.
- Compact design conserves manhole space.





Dossert MICON brand tapeless Crab-type Connector is especially designed for joining up to 12 electrical cables. This connector is an original Dossert design and adheres to the same principle as the tapeless type. Write for special catalog.

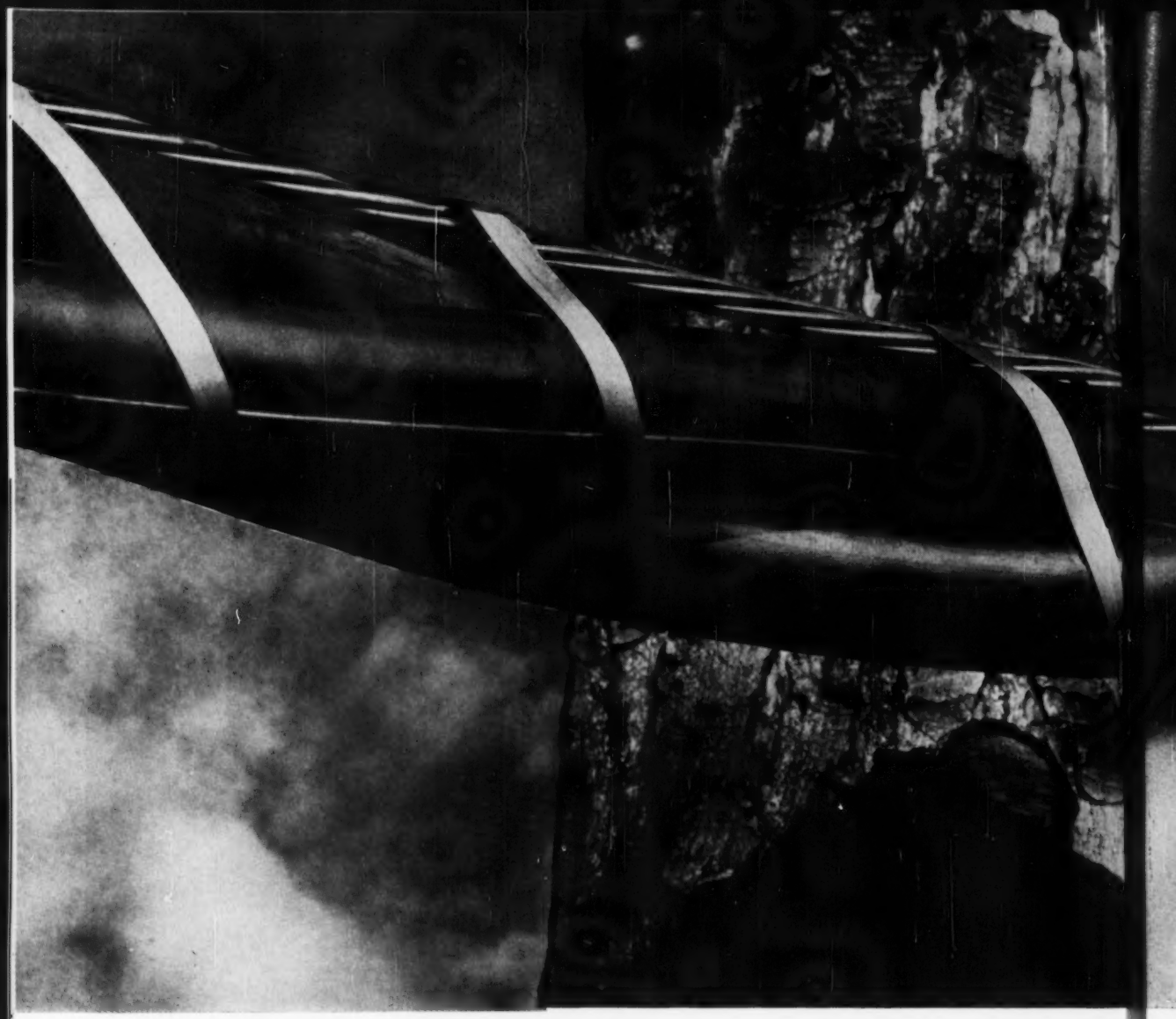
Request also complete UNDERGROUND CATALOG UG 53-1

*Pat. Pend. Reg. Trade Mark applied for

50

DOSSERT MFG. CORP.

249 Huron Street, Brooklyn, New York



Blaze a smaller path

Running a power line through a dense tree area can be a costly job!

With open-wire systems, the path you clear must be a broad one. Otherwise extra-long poles are necessary. Either way costs you plenty.

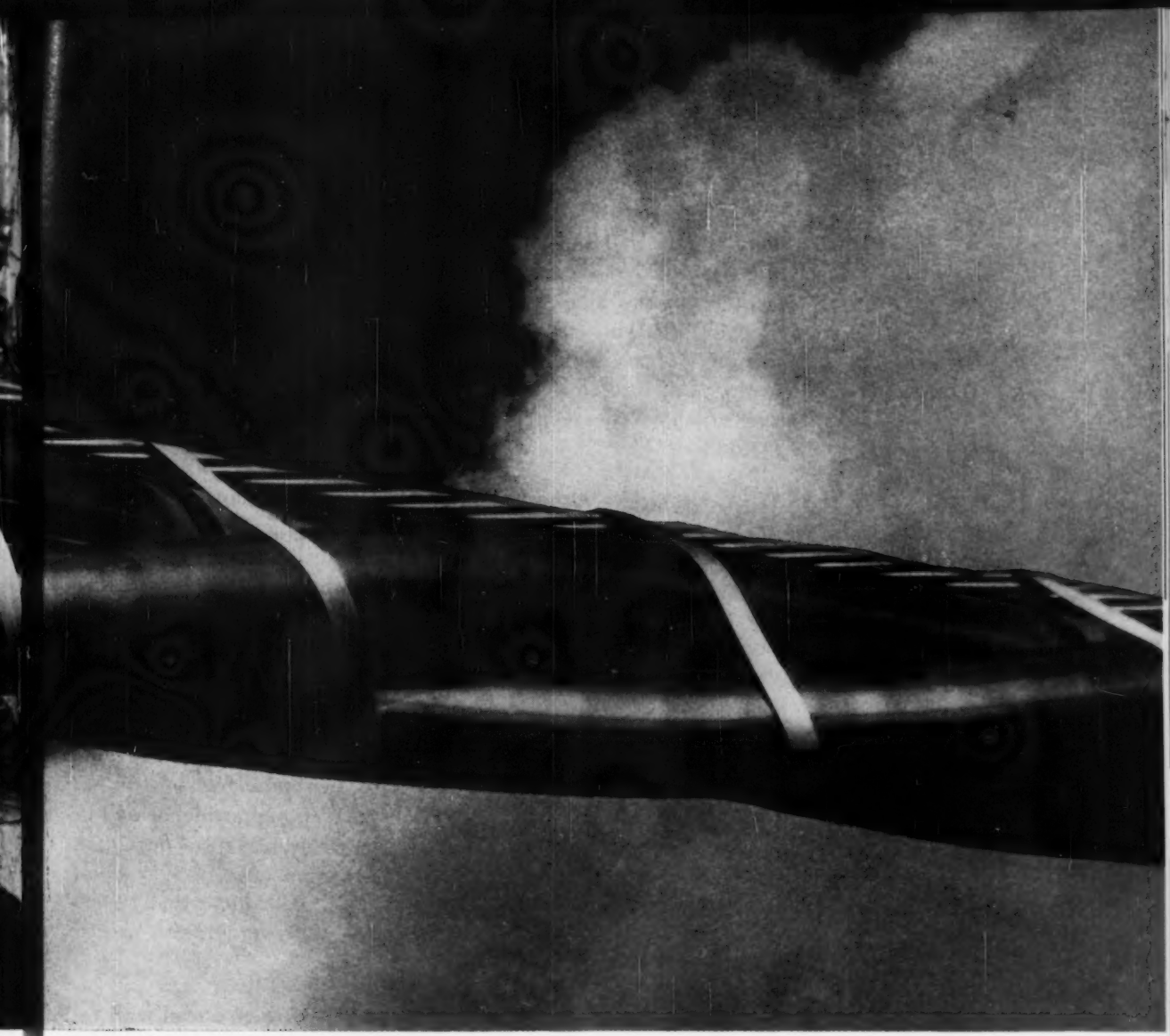
With Rome's reverse-lay preassembled aerial power cable, less tree clearance is required, so you do less tree trimming—initially *and* periodically. Rome aerial cable has a built-in, high-strength messenger for staunch support—capable of supporting falling branches and even trees.

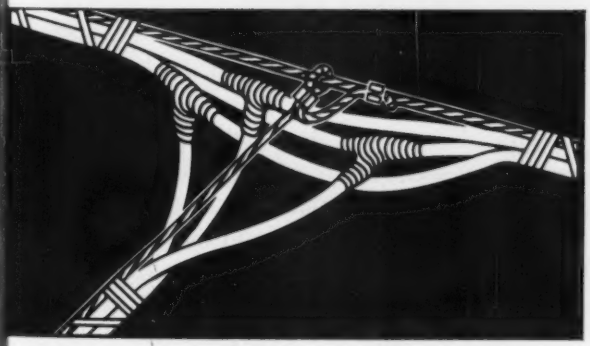
For instance—you need not clear as much of a right of way *initially* as you would for open-wire systems. And you can put off *periodic* tree trimming for as long as five years, compared to the normal two-year requirement for open-wire systems.

Because each conductor is fully insulated and jacketed for maximum resistance to moisture and tree abrasio reverse-lay aerial cable reduces the chance of outages du ing storms and high winds. There's no chance that w branches will cause shorting between phases. And it safer for your line crews to handle during storms . . . saf for the public too!

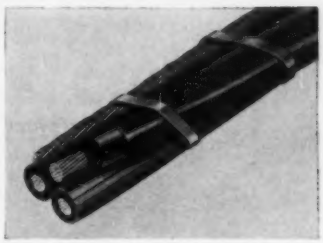
In residential areas, preassembled aerial cable gives yo two *more* advantages. You avoid situations in which th public might feel you are "defacing" property by excessiv tree trimming. And, because it's compact, aerial cabl makes a neat, uncluttered appearance—less likely to brin complaints.

You can get Rome's preassembled reverse-lay aeria power cable in a wide range of constructions, rated up t 15 KV: Rozone (oil-base) or Rozone A (butyl-base) in sulation, Roprene (polychloroprene) or Roseal (flame retardant polyethylene) jacketing. Mail the coupon, now





EASE OF TAPPING Long spans sometimes make mid-span tapping necessary. Rome's reverse-lay preassembled aerial cable construction—where the direction of lay of conductors is reversed at regular intervals along the line—permits easy mid-span tapping. The reversed portions provide sufficient "slack" for taps *anywhere* along the line! This eliminates the necessity of making taps at the pole ends only. Stress is carried entirely on the messenger. Conductors can be untwisted for tapping without cutting—even while the line is hot! Your linemen can use wire guards and rubber blankets for safety and make pole-end taps without use of a platform.



BETTER VOLTAGE REGULATION Because of its close geometric spacing as compared with open-wire circuits, aerial cable has a lower reactance. Voltage drop is about half as great as typical crossarm construction and, for a given voltage drop, power can be transmitted twice as far.

ROME CABLE

Department 1-8 • Rome, New York

☐ Please send me more information on the above.

Name .....

Title .....

Company .....

Street .....

City ..... Zone ..... State .....

MEET THE MAN

WHO'S DEDICATED TO **YOUR** JOB

YOUR ROME CABLE SALESMAN

Procurement & Products

PRICING ▶ **Federal grand jury investigating the pricing policies** of the electrical manufacturing industry—including foreign manufacturers that sell here—is now well under way in Philadelphia. The grand jury is meeting two or three days every other week to look into pricing policies with respect to bids to TVA. This phase is expected to last into January 1960, but there is no assurance that the investigation will terminate then. Some indications point to a continued investigation lasting well into 1960 that will probe into pricing policies towards co-ops, other Federal agencies, municipals, and possibly even private utilities.

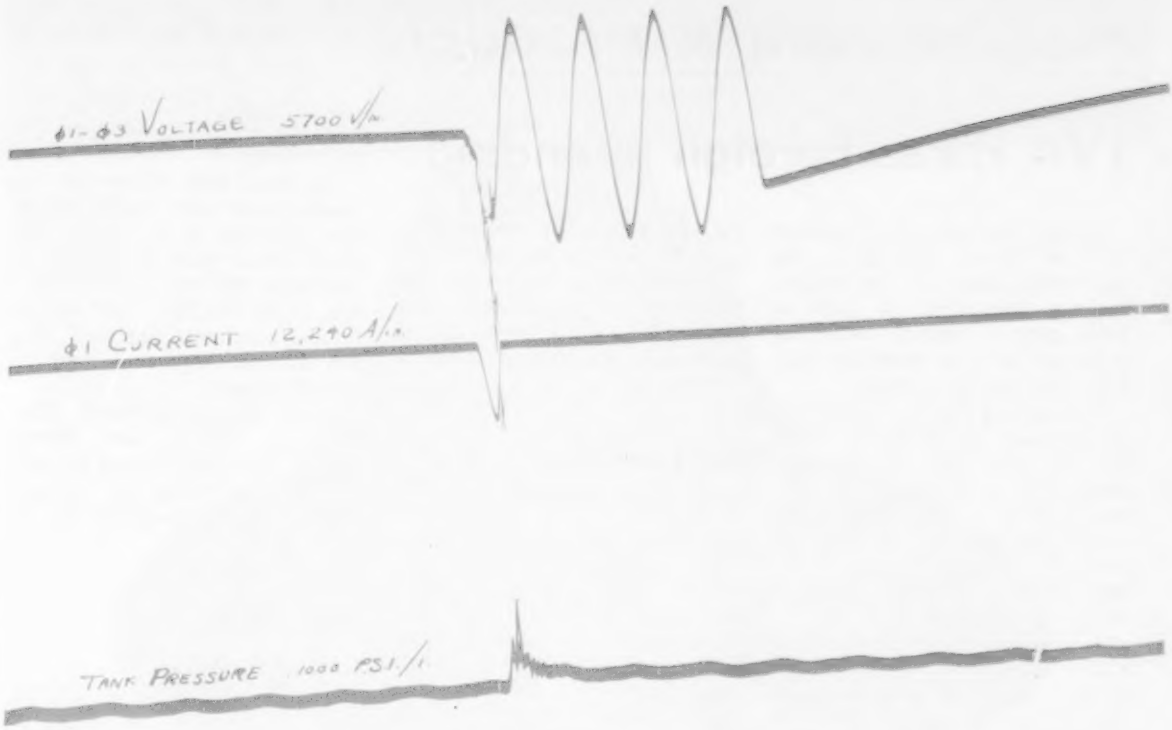
What, specifically, is the grand jury looking for? Authoritative sources say the Government anti-trust attorneys directing the probe want to determine whether there is agreement or collusion within the industry as to: (1) the establishment of prices, (2) the maintenance of established prices, (3) the amounts bid to Federal agencies, (4) the allocation of business of Federal agencies, (5) the maintenance of list prices in bids to public agencies when below-list prices may have been offered to other customers.

How serious is this investigation? The companies involved are not showing too much concern publicly or privately, but sources say the Government attorneys are confident that enough evidence will be produced to win an indictment initiating an anti-trust court case. These sources cite hundreds of complaints that have been received over the years by the Justice Department, coming from virtually every type of power equipment buyer, but rarely, if ever, from a private utility.

In the meantime, Senator Kefauver is planning to go ahead with his investigation of identical bid charges made by TVA. Right now, the word is that he plans to go to Knoxville with his committee right after Congress adjourns to put into the record a three-year study made by TVA on identical bids. After that, it's anybody's guess.

NEWS BRIEFS ▶ TVA bought 27% of its equipment from abroad this past year, or equal to three times as much as it spent on foreign equipment during all the years combined since 1933 (see page 96) . . . Cornell-Dubilier enters transistor market (see page 101) . . . Nema publishes new standards including those for large generating and converting apparatus, gas turbine power plants (see page 101) . . . Baldwin-Lima-Hamilton underbids English Electric in TVA bids (see page 96).

News of Manufacturers . . . . . page 96
New Equipment . . . . . page 102
Readers Service . . . . . page 108



TESTS SHOW EXTRA INTERRUPTING CAPACITY FOR THE G&W FC42 OIL FUSE CUTOUT

interrupting capactity 12,000 amps. asymmetrical - 2.5kv, 200 amps.

extra interrupting capacity 16,000 amps. asymmetrical - 2.5kv, when fused at 100 amperes or less

This cutout can be used where there is an available fault current of 16,000 amperes (asymmetrical) provided that a fuse link rated 100 amperes or less is used. The application rating of 16,000 amperes at 2,500 volts is made possible by the current-limiting action caused by the fuse melting before the current can reach peak value. The fuse melts in only a fraction of the first half of the cycle of fault current and limits the current to a relatively small value.

Investigate the possibilities of using the FC42 in place of more expensive protective equipment. Consider, also, its use for sectionalizing circuits under load. A linkage readily adapts multiples of the cutout to gang operation for use as multi-pole oil switches. A G & W representative will be glad to help you.

G&W ELECTRIC SPECIALTY COMPANY
3500 W. 127TH STREET • BLUE ISLAND • ILLINOIS
CANADIAN MFR.-POWERLITE DEVICES, LTD.-TORONTO, MONTREAL & VANCOUVER
C 581

TVA Hikes Foreign Spending

Foreign manufacturers received 27% of TVA's business in the year ended June 30. In dollars, this was three times as much as TVA spent on foreign equipment in all the 26 years combined that TVA has been in existence.

TVA spent $17,900,000 for overseas products out of the $66,924,-517 it spent for manufactured goods such as turbines, generators and transmission lines. Since 1933, it had spent only $5,600,000 overseas. All but a fraction of the foreign purchases went for generators and transformers.

Total purchases for the year were $125,936,788 which included materials, equipment, supplies and non-personal services. $51,931,238 went for raw materials with coal accounting for $51,000,000 or 41% of the total expenditures. This was $33,500,000 less than was spent for coal the previous year.

Completing the expenditures was $7,081,033 for miscellaneous services which included barging of coal, labor costs in installation contracts and the like.

B-L-H Underbids English Electric on Turbines

Baldwin-Lima-Hamilton apparently underbid English Electric for two or three 48,300-hp hydraulic turbines for TVA's Wheeler Dam. TVA has not yet decided what the number of units will be, but the unevaluated bids for two units showed B-L-H at $1,438,000 and $1,564,000, depending on whether or not to liquidate damages for failure to deliver at the specified time. English Electric bid firm at $1,590,665.

American Elin of Austria was apparent low bidder for the 36,000-kva generators to go with the turbines, with a bid of $1,436,000 for two units. GE was second with a bid of $1,760,300. And for the turbine generators combined, English Electric apparently underbid Allis-Chalmers.

Other bidders included Westinghouse, Elliott, and Brown-Boveri. TVA had 45 days to evaluate bids and award the contracts when the bids were opened Aug. 13.

S&C to Announce Circuit Busters

S & C Electric will soon announce a new Circuit Buster for use on circuits of 69 kv, 138 kv, and perhaps higher. The device will combine a circuit interrupter with a disconnect. The interrupting unit will be in the circuit constantly. The disconnect will open after the circuit interrupter opens.

Hubbard Doubles Cicero Plant Capacity

Expansion of Hubbard's Cicero, Ill., plant, just completed, doubles plant capacity (addition outlined in white). The new section, devoted exclusively to pole line hardware production, is expected to climb to full capacity by late fall.

Original sections of the plant were modernized: new lighting installed, material flow improved by rearrangement of machinery. General and engineering offices are under construction, and employment is being doubled on a two-shift basis. New equipment installed includes a 300-ton blanking and forming press, a 200-ton blanking press, cut threaders and bar shears.

The new plant area includes facilities for blanking, shearing, upsetting, forging, trimming, pointing, cut threading, roll threading and cold heading.

Ohio Ed Orders Devine Vacuum Dry Equipment

A vacuum-drying impregnating system will be built by J. P. Devine Mfg Co, Pittsburgh, for installation in Ohio Edison's Akron, Ohio, transformer renovating plant. Devine says the use of this system promises to be a cost- and time-saving innovation, pointing out that for the first time a utility will have facilities to impregnate its own equipment.

On-the-spot vacuum drying and impregnating of transformers and other equipment which the new system will make possible will save Ohio Edison the usual cost and time involved in returning such gear to the manufacturer. In addition, the number of transformers OE will use will be reduced because no extra ones will be needed to substitute for those in transit.

(*Continued on page* 101)

Quality in Victor suspensions is more than skin deep

VICTOR No. 924
(EEI-NEMA TDJ 52-5)
25,000 lb. SUSPENSION INSULATOR

. . . IT GOES ALL THE WAY THROUGH

From glaze, through porcelain to cap and ball bolt, VICTOR's quality control never stops. VICTOR compounds and manufactures its own glaze . . . glaze that properly fits itself to each insulator, giving high strength and unequalled self-cleaning qualities. Only VICTOR makes its insulators of Purified Porcelain . . . purest, hardest, strongest insulator porcelain ever made! And VICTOR caps and ball bolts are accurately made, double-dip galvanized and 100% gage-tested to insure proper mating, complete interchangeability and conformance to EEI-NEMA Standards.

DID YOU KNOW GLAZE IS REALLY GLASS?

Glaze is what gives a VICTOR Suspension its handsome, glossy appearance. What's more important, however, is that it adds to its durability, strength and self-cleaning characteristics. Glaze is actually glass (with a color pigment added) . . . and nothing cleans easier than glass. To make certain that its glaze is of highest quality, VICTOR makes its own. It is prepared by grinding the glaze mix in a rotating ball mill lined with porcelain brick and filled with thousands of porcelain balls. The mill grinds the glaze to a fineness of less than 10 microns. Each batch is pre-tested and matched to the type of insulator being glazed in order to conform with VICTOR's high standards.

WE GIVE 'EM A REAL BEATING

The VICTOR Suspensions that go on your lines will never have to take the mechanical and electrical loading we give them in the VICTOR laboratory. In fact, our continuous quality control testing program shows that No. 924-25,000 lb. suspensions proof-test, under both electrical and mechanical loading, at values far in excess of EEI-NEMA Standards.

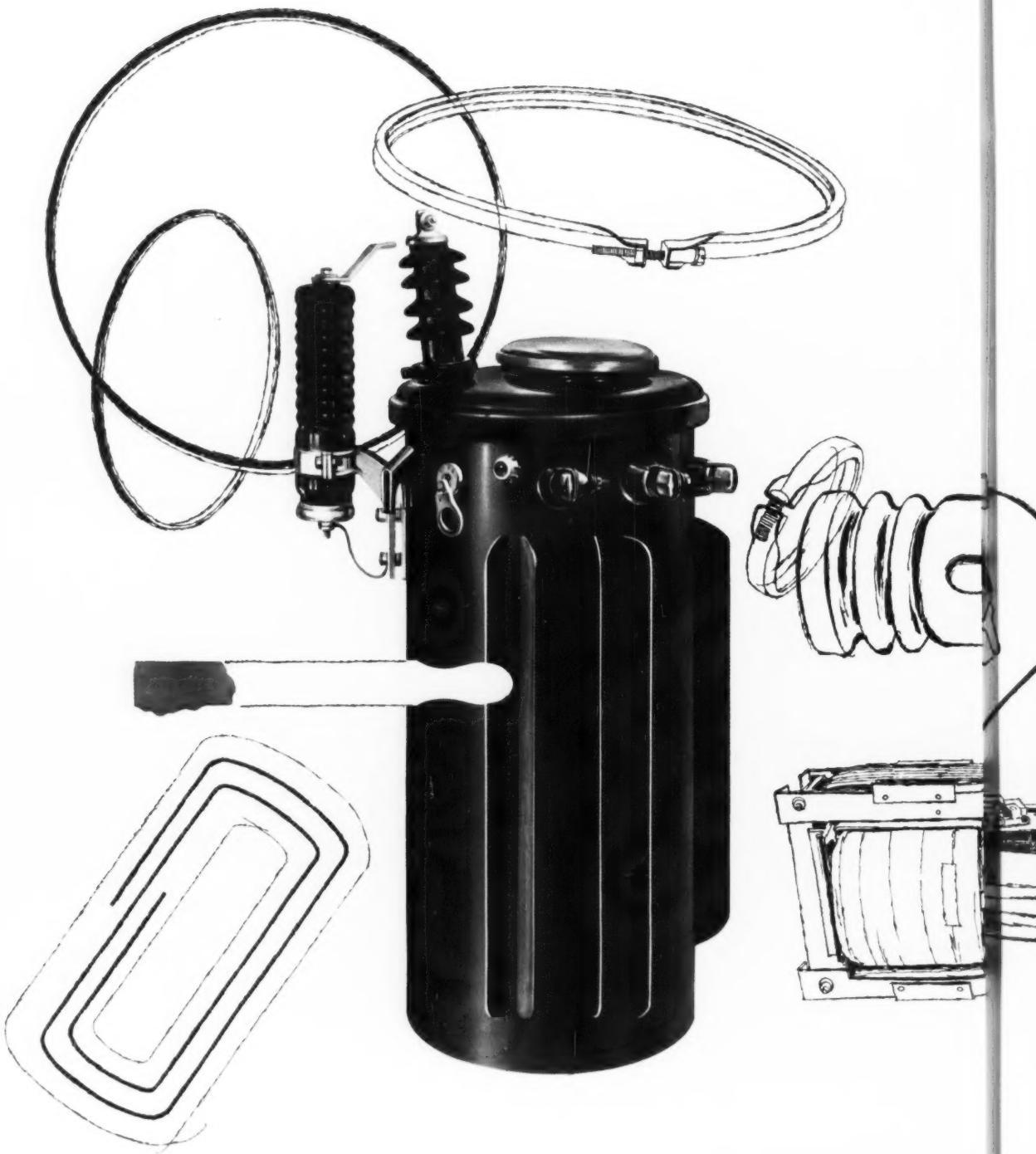
WATER WE USE AT VICTOR IS FAR TOO PURE TO DRINK

The water used in making Purified Porcelain is about as pure as you'll ever find. In fact, it's the reason why Purified Porcelain is the hardest, densest and most durable insulator porcelain ever made. But did you ever try to drink it? Ptui! It's wet and that's all. No taste. Everything that gives drinking water its taste—has been removed by VICTOR's demineralizing process. It isn't worth a plugged nickel for drinking . . . but it sure makes a great porcelain. For specifications, and prices on VICTOR Suspension Insulators, write I-T-E Circuit Breaker Company, Victor Insulators Division, Victor, N. Y.

I-T-E

I-T-E CIRCUIT BREAKER COMPANY
VICTOR INSULATORS DIVISION

Before you buy another



ransformer...

COMPARE FEATURES

General Electric—alone—offers <u>all</u> these exclusives which add up to reliability, long life, less maintenance for you

General Electric innovates to earn your orders. So compare these features with competitive features to determine your best transformer buy.

Be sure to compare *all* features. You'll see that only General Electric offers *all* these exclusives: new long-life Melalast† transformer cover finish; new Permalex† insulation; Formex* wire; AL/CU terminals; Strenicor clamps; stainless-steel bands and Nitrile rubber gaskets; valve-type arresters—so that the sum of individual features adds up to greater value in long reliable life.

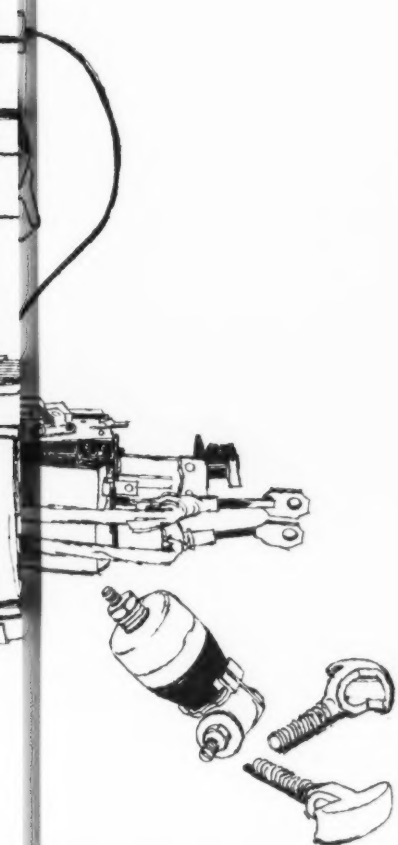
Before you buy another distribution transformer, compare features—give your transformer manufacturer credit for the extra values he gives you. General Electric Co., Schenectady 5, N. Y.

431-81

* Reg. trademark of G.E. Company. † Trademark of G.E. Company.

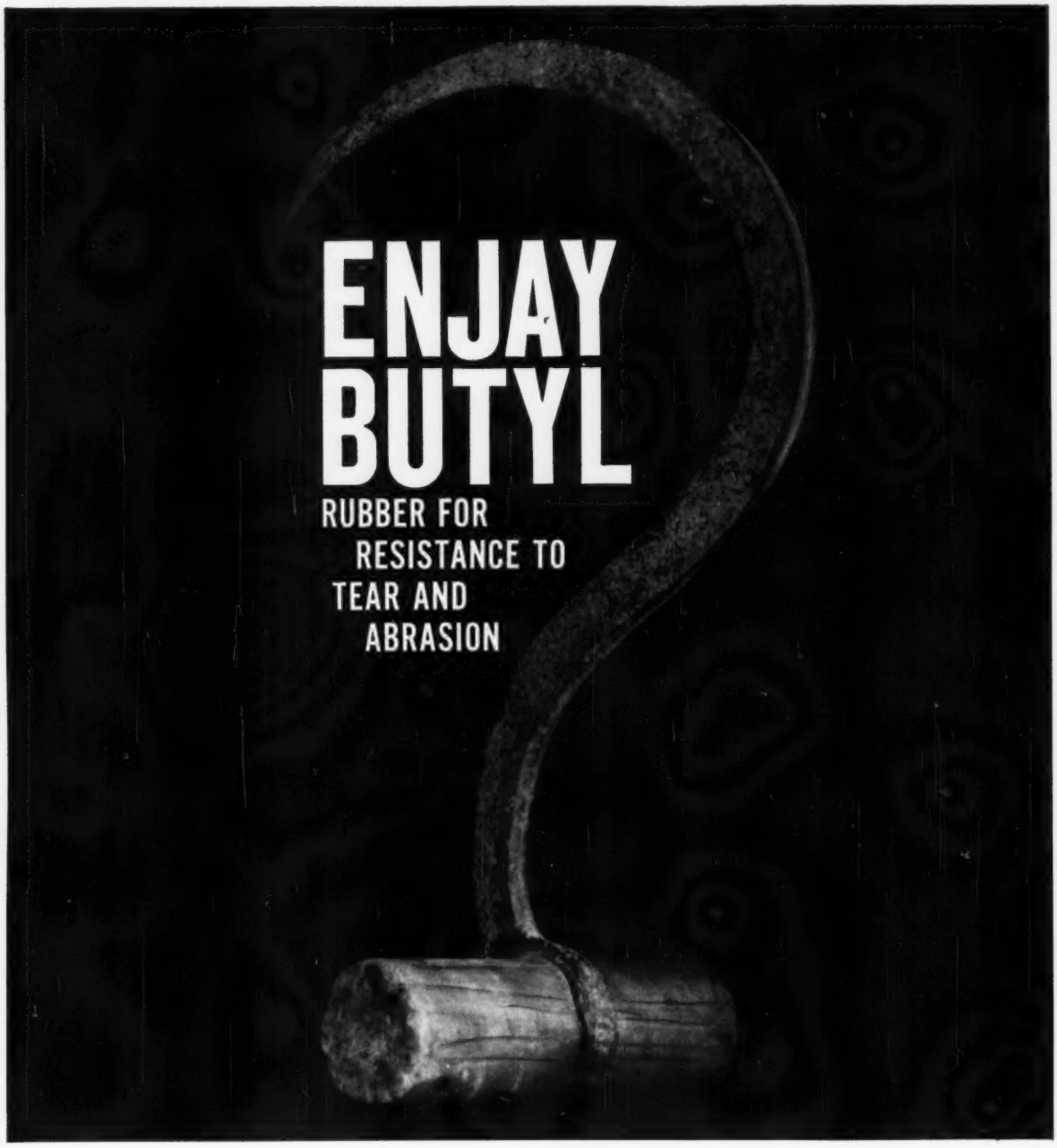
Progress Is Our Most Important Product

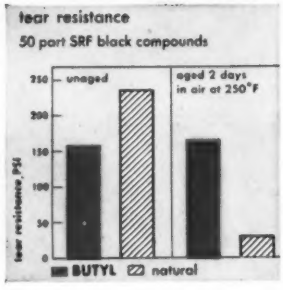
GENERAL ELECTRIC



GIVE YOUR TRANSFORMER MANUFACTURER CREDIT FOR THE EXTRA VALUES HE GIVES YOU		G.E.	OTHER MFRS.			
MEASURE LOAD BUILDING—do Co.'s other products build load? Does Co. sponsor load-building programs?						
CHECK SERVICE—24-hour shipment? repair and uprating? emergency assistance?						
COMPARE FEATURES—how many exclusive features in terms of longer life; reliability; easy maintenance?						
ANALYZE PRICE—does Co. hold line against inflation with significant product developments?						
EVALUATE INNOVATIONS—has Co.'s research paid off for you? Recent examples?						

FILL IN THE BLANKS . . . See which manufacturer gives you more for your transformer dollar: Mark "X" for a measurable contribution, "O" for insignificant contribution.





Enjay Butyl offers the highest aged tear strength of any rubber. Even after long exposure to heat, oxygen and ozone, Butyl retains nearly all its original tear and flex resistance...keeps its stretch without tearing. And Butyl's inherent toughness offers rugged resistance to abrasive wear. Butyl is the preferred rubber and proven superior in such applications as conveyor belts, hoses, heavy-duty off-the-road truck tires, and other mechanical goods.

Butyl also offers...outstanding resistance to chemicals, weathering, sunlight, heat, and electricity...superior damping qualities...unmatched electrical properties and impermeability to gases and moisture.

Find out how this versatile rubber can improve your product. Call or write the Enjay Company, today!

ENJAY ®
BUTYL

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY
ENJAY COMPANY, INC., *15 West 51st Street, New York 19, N.Y.*
Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

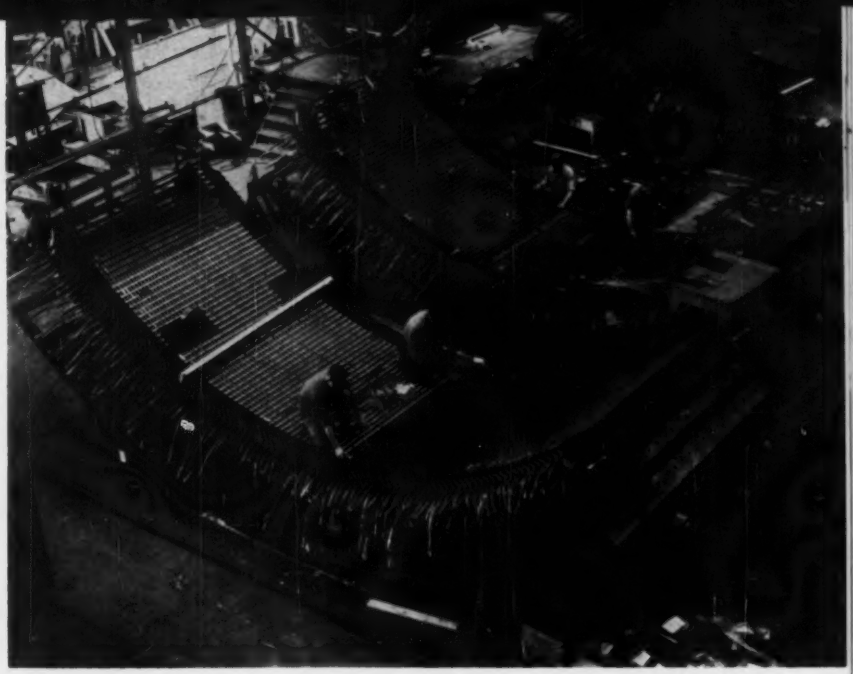
(*Continued from page 96*)

The dryer-impregnator J. P. Devine is building for Ohio Edison is cylindrical in shape, with a working volume which measures 10 ft in dia by 15 ft deep. It is electrically heated and designed to heat transformers under high vacuum to final temperatures in 60-100 hrs.

NEMA Publishes New Standards

The availability of six new NEMA Standards Publications is announced. One of them, "Gas Turbine Power Plants, SM 30-1959," $1.00, is the result of two years of work by engineers from Clark Bros. Co, Division of Dresser Operations, Inc; General Electric; and Westinghouse. Data covers horizontal gas turbine power plants used for stationary mechanical drive or for power generation land installation.

The other standards published are "Industrial Control" (IC 1-1959; $6.00); "Large Generating and Converting Apparatus" (LG 2-1959; 30¢); "Pressure Connectors for Copper Conductors" (SG 8.1-1959); (SG 8.2-1959), both 30¢; and "Returnable Reel Dimensions for Wires and Cables" (WG 20-1959; 25¢).



Westinghouse Assembles NYPA Stators

Fifty-two stator sections like the three shown here are being built by Westinghouse for New York State Power Authority's Niagara hydroelectric power project. Stage in process when the photograph was taken was the winding of copper conductors or coils on the sections.

Assembled stators will be 40 ft in dia. Each of the 13 waterwheel generators Westinghouse is building for the plant is 167,000 kva. Shipment of the final unit is scheduled for early 1961.

Fed Pacific Sets Up Customer Service Centers

Federal Pacific Electric has converted nine of its regional manufacturing plants into self-contained "customer service centers" which will offer completely integrated manufacturing-marketing-engineering services to electrical equipment markets across the country.

FPE Co's general manager of the newly-established Customer Service Center Division, Joseph H. Schlessel, describes his nine-plant operation as an "integrated approach to an old marketing problem," pointing out that it replaces the trend toward concentration of production facilities.

Full complements of design, application, and field sales engineers will be on hand at each customer service center to provide customers with technical information and assistance and to supply complete field service on each installation.

The new network of centers is made up of FPE facilities ranging from 40,000 to 80,000 sq ft, located in the industrial centers of Seattle, Pittsburgh, Cleveland, St. Louis, Los Angeles, Dallas, Boston, Atlanta, and Long Island City, N. Y. Additional service centers will be opened as required.

Cornell-Dubilier Enters Transistor Market

Cornell-Dubilier Electric enters the transistor market, having completed negotiations with the Toshiba Co of Japan to form an international manufacturing-distribution association to distribute the Japanese firm's transistors in the U. S.

The arrangement culminates a mutual search, and will combine the extensive production capabilities of the Japanese firm with C-D's marketing and manufacturing experience in this country.

Allis-Chalmers Uses New Nuclear Test Facility

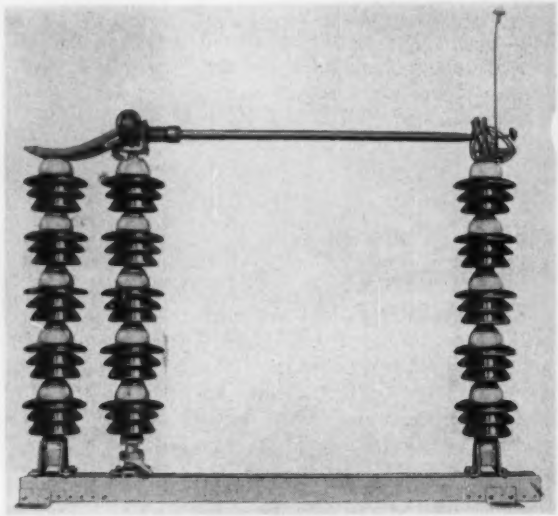
Allis-Chalmers has a new test facility, at its Greendale, Wis., nuclear power lab, which consists of a high-pressure heat-transfer test loop that simulates a nuclear power plant. It supplies heat transfer and pressure drop data required for boiling water nuclear reactor design.

Tests of variables such as fuel element pin diameter, pin arrangement, water voids, water velocity and heat flux provide data for optimum reactor core designs.

(*More Procurement & Products p* 102)

(For further information refer to Reader Service on Page 108)

H-V Power Switch . . .



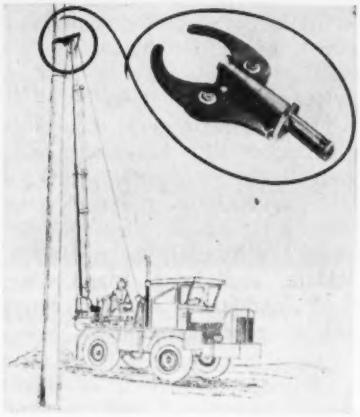
. . . in 230-kv, 900-kv BIL model, extends line of power switches. Type PV2, 1,200 amp switches are available for outdoor group operation in horizontal, vertical or inverted mounting position. The new switches have a momentary rating of 40,000 and 61,000 amp. They feature ease of operation and positive action under adverse conditions for sectionalizing, disconnecting and bypassing application.
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

Dual Voltage Switch . . .

. . . for series-multiple operation is now available on distribution transformers. It provides for a quick changeover to higher voltage for future growth requirements. It is changed by removing and reversing an external operating cap keyed to the switch shaft. A number of voltage combinations are offered.
Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

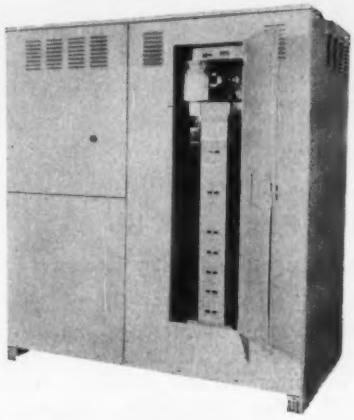
Joint Compound . . .

. . . resists temperature changes. Known as "Cualaid," the compound remains smooth and easy working at temperatures to —100F. When directly exposed to a flame it will not liquefy. It is inert to natural rubber and leather goods and is non-staining, non-poisonous and non-irritating. "Cualaid" is used for both aluminum-to-aluminum and aluminum-to-copper.
Penn-Union Electric Corp, Erie, Pa.



Pole Aligner . . .

. . . is designed to handle any size pole. The Hydra-Pike consists of two hydraulically-operated pincer-type arms mounted on a steel platform at the derrick head sheave. The complete system can be mounted on most derricks, cranes, booms and diggers. It is designed for one-man operation, and it eliminates the need for pike poles.
Calavar Corp, 2700 S Broadway, Los Angeles 7, Cal.



Distribution Center . . .

. . . with high-temperature insulation is up to 30% smaller, 15% lighter than previous designs, and 16 db quieter than NEMA standards. A one-piece design uses QHT (Quiet-High Temperature) transformers and combines incoming line switch and fusing, transformer and outgoing feeder breakers into an integral unit. The line is available in ratings from 75 to 225 kva, with

(*Continued on page* 106)

When "GOOD ENOUGH" isn't enough

use TRIANGLE CONTROL CABLE

Failure in a control cable is a messy business. The fault is hard to find, and operations must stop until it *is* found. That's why contractors and engineers don't use just a "good enough" cable is those vital links—they want the best. Many now guarantee this by specifying and using Triangle Control Cable.

But, there is no such thing as *one* all-purpose control cable construction. That's why Triangle makes these five general types—each designed for a particular set of circumstances:

1. **Rubber insulated, braid covered**
2. **Rubber insulated, Trioprene sheath**
3. **Rubber insulated, lead sheath**
4. **Trioseal insulated, Trioseal sheath**
5. **Triolene insulated, Trioseal sheath**

These are available in conductor sizes 14 to 9 with 1 to 37 conductors. Special types to meet unusual conditions are made to specifications. Types of control cable are available for aerial, conduit, tray, underground duct and direct burial installations.

Informative technical literature is yours for the asking.
Write for your copy of our Control Cable Bulletin.

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

"It MUST Be Right!"

NEW UTILITY STATIONS, C-E EQUIPPED

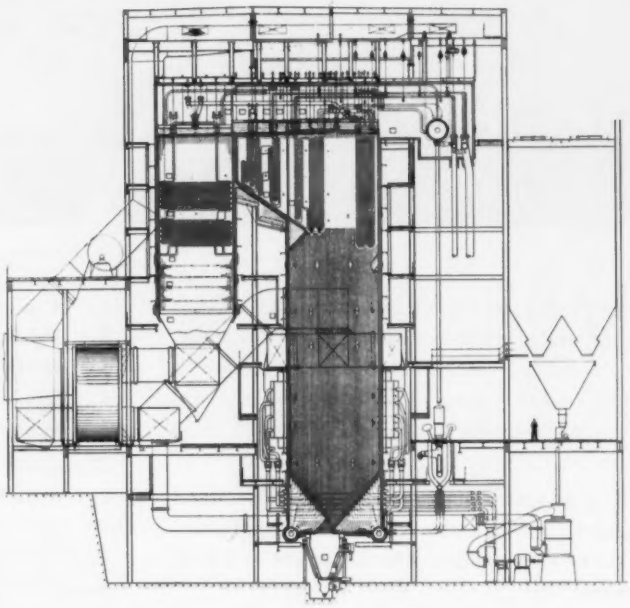
Includes only new stations on new sites placed in operation since JANUARY 1, 1950.

LAKE CATHERINE
HUTCHISON
YATES
DUNKIRK
TITUS
LEE
CONTRA COSTA
HAWTHORN
NINEMILE POINT
EDGE MOOR
PALATKA
JOHNSONVILLE
DANSKAMMER
BECKJORD
HIGHGROVE
PLANT X
BLACK DOG
ALBANY
JOPPA
MERAMEC
PORTSMOUTH
LAKE CREEK
ETIWANDA
AURORA
HENNEPIN
EASTLAKE
OAK CREEK
SUWANNEE RIVER
URQUHART
KINGSTON
SANDOW
MULLERGREN
BARRY
NORTH OMAHA
WILMINGTON
CARBON
SAGUARO
MORRO BAY
VERMILION
JOHN SEVIER
COLLIN
MILLIKEN
GALLATIN
BARRETT
MITCHELL
SAN BERNARDINO
YORKTOWN
GULF COAST
TUCSON
PORT WENTWORTH
W. A. PARISH
ALLEN
MONTROSE
McMEEKIN
LEWIS and CLARK
ROY S. NELSON
YUMA AXIS

DICKERSON

New Dickerson Station

GOES INTO SERVICE



The C-E unit shown above—one of two duplicates—is now in service at the Dickerson Station of Potomac Electric Power Company. Each of these units is designed to serve a 175,000 kw turbine-generator operating at a throttle pressure of 2400 psi with a primary steam temperature of 1050 F, reheated to 1000 F. They are of the controlled-circulation, radiant reheat type with convection reheater surface located between the primary and finishing superheater surfaces. The secondary superheater surface is at the top of the furnace adjacent to the front wall. An economizer section follows the primary superheater surface in the rear pass, and regenerative air heaters follow the economizer surface. Pulverized coal firing is employed using bowl mills and tilting, tangential burners.

On June 9, 1959, unit No. 1 of the new Dickerson Station of Potomac Electric Power Company was placed in service. This 175,000 kw unit is one of two duplicates, the second of which is scheduled for service early next year. This first unit at Dickerson Station is the *sixteenth* 2400-lb throttle pressure, C-E Controlled Circulation Boiler to go on the line throughout this country—there are two in service abroad.

Located on the Potomac River about 35 miles north of Washington, D.C., this station will supply power to the Potomac Electric Power service area which includes, in addition to Washington, parts of Maryland and Virginia.

Dickerson Station, which was designed and constructed by Stone & Webster Engineering Corp. in conjunction with the Engineering Departments of Potomac Electric Power Company, will operate two units from a central control room. Power is transmitted at 230,000 volts.

Both generating units at the Dickerson Station are served by C-E Controlled Circulation Boilers, a cross-sectional elevation and brief description of which appear on the opposite page.

COMBUSTION ENGINEERING

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

C-237

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

Distribution Center . . .

(*Continued from page* 102)

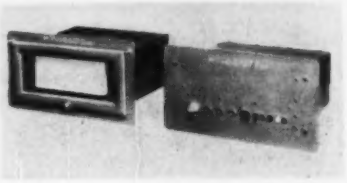
primary voltages from 2,400 through 4,800 v and secondary voltages from 208Y/120 through 600 v. **General Electric Co, Schenectady 5, N. Y.**

Chart Changer . . .

. . . **automatically changes** circular recording charts. Called the Automatic Meterman, the method affords the utilization of as many as 40 circular charts in a single recorder; disengages the charts, one by one, at virtually any desired time/date frequency; and drops them by gravity into a storage box.
Maeder-Squier Co, Box 5145, Dallas 22, Tex.

Operations Recorder . . .

. . . **operates only upon a change** in incoming signal in either the



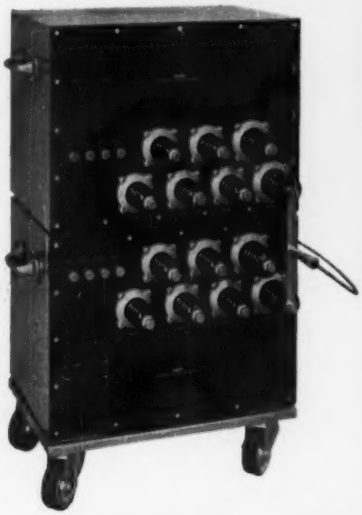
analog or digital channels. An electro-sensitive record is produced by transistorized sensing circuits powered from a nickel-cadmium battery. There are 6 off-on channels and 1 analog (digitized) channel.
Hathaway Instrument Div, Hamilton Watch Co, 5800 E Jewell Ave, Denver 22, Colo.

Magnetic Tape Unit . . .

. . . **for use with RW-300 Digital Control Computer** is now available. Data is collected automatically from more than 6,000 sensing instruments, converted to digital form, and stored on magnetic tape at a rate up to 2,560 readings per sec.
Thompson-Ramo-Wooldridge Products Co, Box 90067, Airport Station, Los Angeles 45, Cal.

Test Set . . .

. . . **for instrument transformers** can supply all commercial voltages up to 14,400 v. The Knopp Uniload Test Set consists of three major parts: a Type WP-14000 Knopp



Precision Multirange Potential Transformer; a Type LP-14000 Knopp Heavy-Duty Loading Trans-

WHY G-E UNIT-CONSTRUCTED ARRESTERS ARE THE KEY TO REAL DOLLAR SAVINGS

by E. J. ALLEN, General Electric's Supervisor of Station Equipment Sales

Substantial savings can be realized by the elimination of "complete arrester" inventories. And only unit-constructed arresters make these savings possible. Utilities who stock spare "complete arrester" poles of several ratings can reduce their inventories by stocking only appropriate ratings of the unit-constructed General Electric station-class arrester.

THREE BASIC UNITS of the Form 3K arrester, available from factory and district stocks, provide all necessary "building blocks." These single, easily-handled units can be readily added or removed to change arrester ratings. For example, when increasing a 138-kv grounded neutral system—using an "80 percent" 121-kv arrester—to a 230-kv grounded neutral system—using a "75 percent" 182-kv arrester—you need add only one 60-kv Form 3K arrester unit and grading ring.

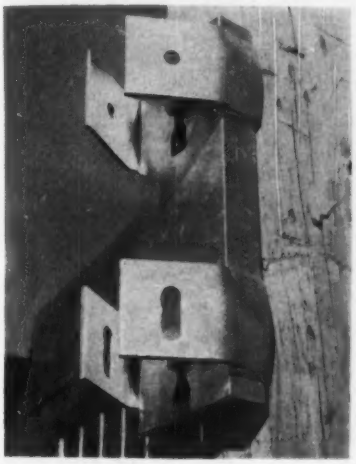
ONLY THE G-E MAGNE-VALVE station-class arrester combines the advantage of rugged unit construction and built-in anti-contamination feature with service-proved Magne-valve electromagnetic principle of arc interruption. And, of course, modern Thyrite* station-class arresters can be "hot-washed" with hose or spray systems.

For complete details contact your G-E Representative or write Section 435-20, General Electric Company, Schenectady, N. Y.

*Reg. Trademark of the General Electric Company.

GENERAL ELECTRIC

former; and a rubber-tired carriage. **Knopp, Inc, 1307 66th St, Oakland 8, Cal.**



Pole Bracket . . .

. . . **mounts two transformers** on single bracket. The No. 3022 bracket will hold two 3, 5 or 7½-kva transformers mounted in parallel. It is furnished with either 6 or 8-in. channel back.
Hughes Brothers, Seward, Neb.

Ratchet Lever Hoist . . .

. . . **has a sealed brake chamber.** Five models in the MA Series range from ¾-ton to 6-ton capacities and feature brake chambers neoprene-sealed in five places against water, oil, chemicals and dirt.
Coffing Hoist Div, Duff-Norton Co, Danville, Ill.

More New Products

Multiplex carrier system features transmitter crystal control, miniaturized plug-in assembly, and compatibility with transmission standards. The B-640 has 24 channels. —Raytheon Co, 103 River St, Waltham 54, Mass.

Open-gear **lubricant** for outdoor equipment features effective prevention of rust and corrosion; and avoidance of dripping, thinning and throw-off in service. The compound is known as "Gredag".—Acheson Colloids Co, Port Huron, Mich.

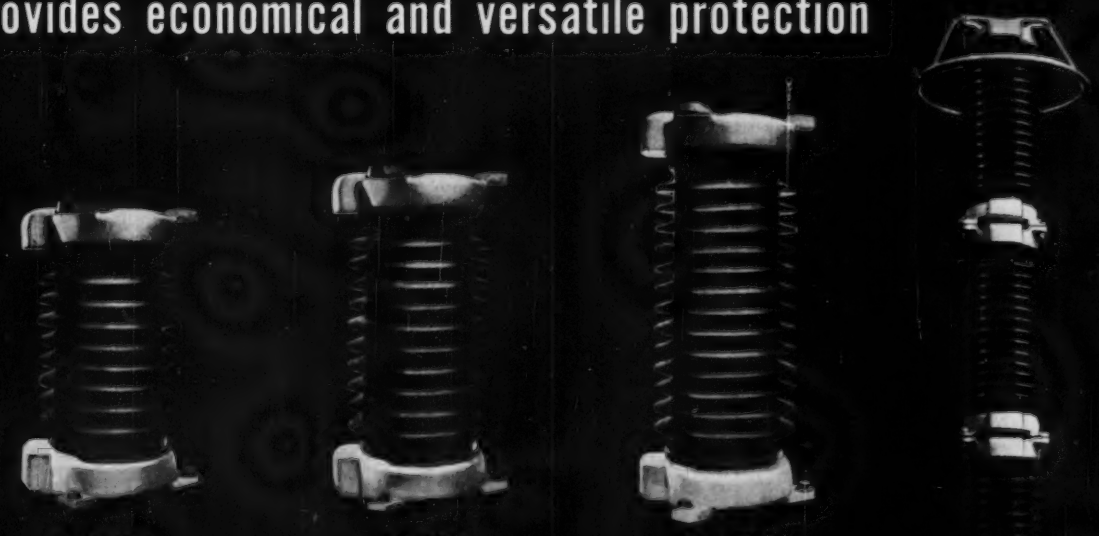
Multi-purpose **ultrasonic cleaner** can wash and rinse parts simultaneously. The Series 400 SonBlaster operates from a 115-v, 60-cycle outlet.—Narda Ultrasonics Corp, Westbury, N. Y.

Portable **battery chargers** can be mounted on a wall or wheeled to battery locations. Known as Variable Voltage Rectifiers, the units are used on batteries with up to 32 lead-acid cells or 50 alkaline cells.—Exide Industrial Div, Electric Storage Battery Co, Philadelphia, Pa.

Continuous **liquid level measurement** using ultrasonics can measure temperatures from cryogenic levels to molten metals. The Metasonic system uses solid metal acoustic wave guides to derive information. —General Ultrasonics Co, 6 Tobey Rd, Bloomfield, Conn.

Cast aluminum **cable support** provides rain-tight seal and ventilation for vertical runs. Called Type "CV", the model may be used for one or more wires in conduit sizes from 2 to 5 in.—O. Z. Mfg Co, Inc, Brooklyn 17, N. Y.

construction of station-class lightning arresters provides economical and versatile protection



42 KV 48 KV 60 KV

Basic building units of the General Electric Form 3K station-class lightning arresters. These units are stacked to provide a variety of ratings for high- and extra-high-voltage circuits, 69-kv to 460-kv, as shown with 182-kv arrester on right for 230-kv Grounded Y system. This is but one of 15 standard ratings constructed from basic units.

GENERAL ELECTRIC

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

Line Material.....Power Switch ☐
Allis-Chalmers.Transformer Switch ☐
Penn-Union .....Compound ☐
Calavar.....Pole Aligner ☐
GE.....Distribution Center ☐
Maeder-Squier .....Changer ☐
Hathaway .....Recorder ☐
Thompson-Ramo-Wooldridge.....
.....Tape Unit ☐
Knopp.....Test Set ☐
Hughes .....Bracket ☐
Coffing Hoist.....Hoist ☐

OTHER

Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

* **Note: Requests must be received within four weeks of publication date, accompanied by complete information specified. This service cannot be offered to readers in foreign countries or to competitive manufacturers.**

NAME _____
TITLE _____
DEPT. _____
COMPANY _____
ADDRESS _____

FOR:
Reference ..... ☐
Specs ..... ☐
Trial ..... ☐
Purchase ..... ☐

AUGUST 31, 1959

AUTOMATIC STREET LIGHTS
MOSCOW (UPI) — Street lights that automatically switch on at night and off in the morning have been installed in the city of Simferopol. The lights are controlled by a photoelectric "eye" that reacts as twilight sets in and, again, at dawn.
BOSTON GLOBE 5/21/59

something's been added
to the poles of Simferopol!

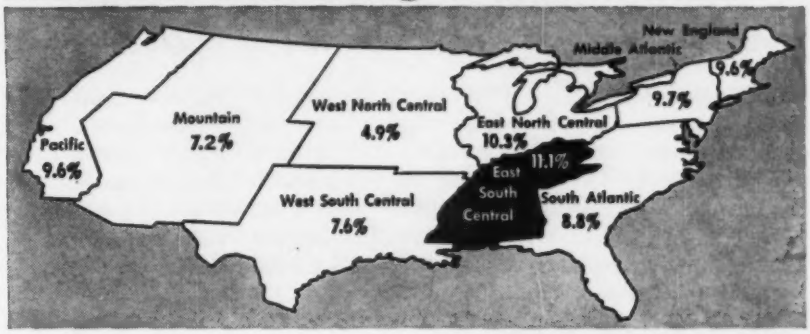
We're always happy to welcome a new convert to photoelectric streetlighting control — and the news flash above calls for special salutations. It's too bad there aren't more details — such as what's in the circuit, who built it and what kind of protection he's got.

It does seem, though, that there may be a few little problems peculiar to their locale. If there should be a sudden change in the office of the Commissar of Streetlighting, the new man may not be satisfied with the former mounting methods, turn-on times, protective devices and the like. A new broom could sweep away all the old specs and demand new ones — and get a whole new set of problems in the bargain. And if there's one place the lights had *better* turn on night in and night out — well .... It certainly makes control reliability a life-or-death proposition, and a failure rate of 0.0001% per year unspeakable.

So welcome to the clan, comrades; and the best of luck with whatever you've put up on the poles of Simferopol. We only wish *we* could claim we'd been first in this business, but that's out of the question now. One suggestion though: if you do run into long-term reliability problems and things start popping, give us a call. Maybe some of the answers we've found in the various controls we've built since 1945 could be just the ticket. They're capitalistic, but quite a few utilities here think enough of them to use them — and even some of our competitors prefer our design. The Fisher-Pierce Co., 82 Pearl Street, South Braintree 85, Massachusetts.

FP
FISHER PIERCE
PHOTOELECTRIC LIGHTING CONTROLS
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

East South Central Region leads Pack as...



Utilities' Net Income Climbs 9.1%

12 Months Ended...	Dec 31 1957	June 30 1958	Dec 31 1958	June 30 1959

Report on
Utility Earnings

Net incomes of most power companies continued to forge ahead during the twelve months ended June 30, 1959. A broad sample of 144 operating electric utilities showed an average gain of 9.1% (before all dividends) over the preceding twelve-month period that ended June 30, 1958. Most of the gains resulted from better business conditions (the preceding twelve months had included most of the recession), but accounting adjustments also were partially responsible for the largest average increase in utility net incomes since EW began its sample.

Leading region was the East South Central, with an average increase of 11.1% in net income. Not far behind was the industrial East North Central Region, where power companies chalked up an average 10.3% gain. New England, the Middle Atlantic, and the Pacific Regions all scored gains of between 9% and 10%. The West North Central Region had the smallest increase, with 4.9%.

The Florida companies stayed close to the top in net-income growth. Operating revenues of the four largest utilities in the state went up by only 6.6%, but the four were able to turn a large proportion of these increased revenues into net income, ending up with a 12.2% average gain. Revenues grew faster in Texas (9.8%), but the net incomes of the eleven Texas companies included in the sample did not go up as much as the Florida utilities'. The Texas average was 9.3%, above average for the U. S., but behind such other large states as New York (10.8% average), Massachusetts (10.3%), and California (9.4%).

The "big city" utilities had a good year. Commonwealth Edison was the outstanding performer, with a 26.9% gain in net. Boston Edison showed a 23.8% increase in net income, and Baltimore Gas & Electric registered a 22.6% gain. Other city companies that showed better-than-average net income gains included Consolidated Edison of New York (11.6%) and Detroit Edison (9.5%).

Commonwealth Edison showed the biggest dollar increase in net income, as well as one of the largest percentage gains in the U. S. The Chicago utility boosted its net by $14.8 million, in spite of a half-million-dollar decline in interest charged

Here Are Net Incomes for 144

COMPANY	1959	1958	COMPANY	1959	1958
Alabama Power(a)	$19,593,992	$17,652,117	Fall River Electric Light(b)	$886,411	$813,040
Appalachian Power(a)	19,365,982	18,646,787	Florida Power	10,915,964	10,791,921
Arkansas-Missouri Power	1,242,321	1,268,438	Florida Power & Light	26,163,417	22,241,461
Arizona Public Service	7,360,000	6,853,000	Georgia Power(a)	20,687,133	18,594,964
Arkansas Power & Light(a)	8,494,274	8,349,580	Green Mountain Power	703,487	680,168
Atlantic City Electric	6,274,111	5,400,679	Gulf Power(a)	3,307,437	3,050,576
Baltimore Gas & Electric	20,491,000	16,715,000	Gulf States Utilities	14,769,902	12,211,166
Bangor Hydro-Electric	1,337,403	1,037,419	Hartford Electric Light	6,761,000	6,062,000
Blackstone Valley G & E(b)	2,056,209	1,715,768	Houston Lighting & Power	19,967,883	19,586,128
Boston Edison	11,799,185	9,534,343	Idaho Power	7,335,493	7,470,377
Brockton Edison	1,441,980	1,331,092	Illinois Power	17,471,305	15,059,465
California Electric Power	5,457,570	4,092,057	Indiana & Mich. Elec(a)	11,990,797	10,187,940
California-Pacific Utilities	974,698	921,333	Indianapolis Power & Light	8,788,176	8,161,504
Carolina Power & Light	12,492,983	12,124,666	Interstate Power	4,259,750	3,995,663
Central Hudson G & E	5,192,180	4,628,378	Iowa Electric Light & Power	4,417,346	4,334,568
Central Illinois Electric & Gas	3,728,625	3,287,037	Iowa-Illinois Gas & Electric	5,741,950	5,586,494
Central Illinois Light	5,675,033	5,334,750	Iowa Power & Light	5,070,944	4,762,940
Central Illinois Public Service	10,156,091	9,940,041	Iowa Public Service	4,219,137	3,950,173
Central Louisiana Electric	2,990,491	2,936,064	Iowa Southern Utilities	1,890,300	1,739,916
Central Maine Power	6,190,186	7,050,581	Jersey Central P & L(a)	7,331,309	6,049,936
Central Power & Light (a)	9,818,060	9,143,866	Kansas City Power & Light	9,838,989	10,200,049
Central Vermont P S	1,690,919	1,464,972	Kansas Gas & Electric	6,747,380	6,274,982
Cincinnati Gas & Electric	15,456,233	16,715,691	Kansas Power & Light	7,960,778	6,785,279
Cleveland Electric Illum	20,114,828	18,592,543	Kentucky Power(a)	1,517,616	1,336,866
Colorado Central Power	755,604	660,754	Kentucky Utilities	7,969,901	6,416,596
Columbus & Southern Ohio	6,849,000	7,246,000	Kingsport Utilities(a)	425,581	478,896
Commonwealth Edison	69,967,454	55,134,671	Lake Superior District	1,161,342	1,133,443
Community Public Service	1,684,217	1,638,249	Long Island Lighting	17,948,000	16,259,000
Connecticut Light & Power	13,012,701	12,051,040	Louisiana Power & Light(a)	7,073,257	6,654,655
Consolidated Edison of N. Y.	68,339,217	61,252,561	Louisville Gas & Electric	9,488,175	9,001,629
Consumers Power	34,039,872	32,312,119	Lynn Gas & Electric(b)	837,320	926,097
Dallas Power & Light(b)	9,379,156	8,588,993	Maine Public Service	781,347	692,821
Dayton Power & Light	10,610,000	10,995,000	Merrimack-Essex Elec.(b)	2,001,567	1,777,613
Delaware Power & Light	7,875,060	7,268,950	Metropolitan Edison(a)	8,962,959	8,597,145
Detroit Edison	33,049,467	30,185,763	Minnesota Power & Light	4,579,484	4,820,445
Duke Power	23,351,914	22,035,965	Mississippi Power(a)	3,283,902	3,175,971
Duquesne Light	20,774,063	21,431,655	Mississippi Power & Light(a)	5,377,043	4,774,290
Edison Sault Electric	328,584	292,406	Missouri Power & Light(a)	1,734,445	1,473,601
El Paso Electric	3,442,700	3,168,677	Missouri Public Service	2,119,822	2,266,677
Empire District Electric	1,956,094	1,671,645	Missouri Utilities	630,707	634,041

Operating Electric Utilities*

COMPANY	1959	1958
Monongahela Power(a)	$6,469,790	$6,137,972
Montana Power	11,958,160	10,678,784
Narragansett Electric(a)	2,921,205	2,778,789
New England G & E(c)	4,275,975	3,756,692
New England Power(a)	8,496,057	8,219,163
New Jersey P & L(a)	2,705,984	2,538,932
New Orleans P S(b)	4,212,212	4,795,907
New York State E & G	15,161,811	13,107,800
Newport Electric	244,900	195,851
Niagara Mohawk Power	30,254,909	29,406,571
Northern Indiana PS	14,731,648	13,804,133
Northern States Pwr (Minn.)	23,805,589	21,854,207
Northern States Pwr (Wisc.)	3,274,449	3,035,677
Northwestern Public Service	1,144,888	1,118,961
Ohio Edison	26,917,290	25,399,439
Ohio Power(a)	20,700,785	20,205,641
Oklahoma Gas & Electric	11,493,784	10,604,984
Orange & Rockland Utilities	3,274,429	2,531,730
Otter Tail Power	2,305,526	1,952,712
Pacific Gas & Electric	86,063,665	80,980,220
Pacific Power & Light	11,402,658	10,842,006
Pennsylvania Electric(a)	16,771,083	15,231,931
Pennsylvania Power & Light	24,410,353	22,218,010
Philadelphia Electric	41,609,736	38,497,324
Portland General Electric	6,094,635	6,515,633
Potomac Edison(a)	5,095,414	5,010,550
Potomac Electric Power	11,959,023	9,965,662
Public Service Electric & Gas	39,269,871	34,499,439
Public Service of Indiana	16,694,661	15,526,321
Public Service of N. H.	4,958,542	4,664,245
Public Service of New Mex.	3,195,002	2,540,717
Puget Sound Power & Light	6,848,040	6,167,164
Quincy Electric(a)	193,031	165,682
Rochester Gas & Electric	8,865,704	6,787,672
San Diego Gas & Electric	8,050,120	6,465,267
St. Joseph Light & Power	1,123,633	1,078,357
Savannah Electric & Power	1,674,157	1,988,748
Sierra Pacific Power	1,794,556	1,575,286
South Carolina E & G	7,967,944	7,949,029
Southern California Edison	41,426,087	36,366,503
Southern Indiana G & E	$2,949,782	$2,860,020
Southern Nevada Power	1,260,146	896,155
Southwestern Electric(a)	7,306,653	6,322,282
Southwestern Public Service	9,341,960	8,411,739
Suburban Electric(b)	860,719	891,918
Tampa Electric	5,036,773	4,407,437
Texas Electric Service(a)	16,814,528	15,392,617
Texas Power & Light(a)	13,908,258	13,132,220
Toledo Edison	7,344,748	6,671,476
Tucson Gas Electric L & P	2,572,016	2,781,030
Union Electric	19,972,000	19,970,000
United Illuminating	5,326,446	4,542,541
Utah Power & Light	8,964,934	8,722,096
Virginia Electric & Power	26,657,897	25,763,288
Washington Water Power	7,249,039	5,969,808
West Penn Power(b)	14,888,207	14,112,841
West Texas Utilities(a)	5,002,144	4,338,276
Western Light & Telephone	1,922,515	1,770,175
Western Massachusetts	4,322,917	3,915,080
Wheeling Electric(a)	860,637	803,494
Wisconsin Electric Power	15,741,193	12,458,759
Wisconsin Power & Light	7,957,233	6,973,127
Wisconsin Public Service	6,119,075	5,541,297
Worcester County Elec(b)	2,754,218	2,260,624
Total—144 companies	**$1,522,879,557**	**$1,395,749,157**

(a)—All common shares owned by a holding company.
(b)—Most common shares owned by a holding company.
(c)—Holding company controlling 4 operating companies.

*

For the 12 months ended June 30, 1959 and June 30, 1958

One substitution has been made in EW's 144-company sample. Lake Superior District Power Co takes the place of Housatonic Public Service Co, whose earnings had not been reported at press time.

to construction. A $26.4-million rate increase granted in June 1958 helped operating revenues, which rose by more than $50 million on expanding residential, commercial, and industrial sales. Total net was just under $70 million.

Largest net was registered by Pacific Gas & Electric Co, with $86 million. Commonwealth Ed squeezed into the second spot over Consolidated Edison of New York, whose net income topped $68 million. Philadelphia Electric and Southern California Edison both exceeded the $40 million mark for the first time, and Public Service Electric & Gas added $4.8 million to reach $39.3 million.

These Ten Companies Made Largest Net-Income Gains

Company	Percent Increase
Southern Nevada Power	40.6
California Electric Power	33.4
Rochester Gas & Electric	30.6
Orange & Rockland Utilities	29.3
Bangor Hydro-Electric	28.9
Commonwealth Edison	26.9
Wisconsin Electric Power	26.3
Public Service of New Mexico	25.8
Newport Electric	25.0
San Diego Gas & Electric	24.5

While These Ten Showed the Largest Declines

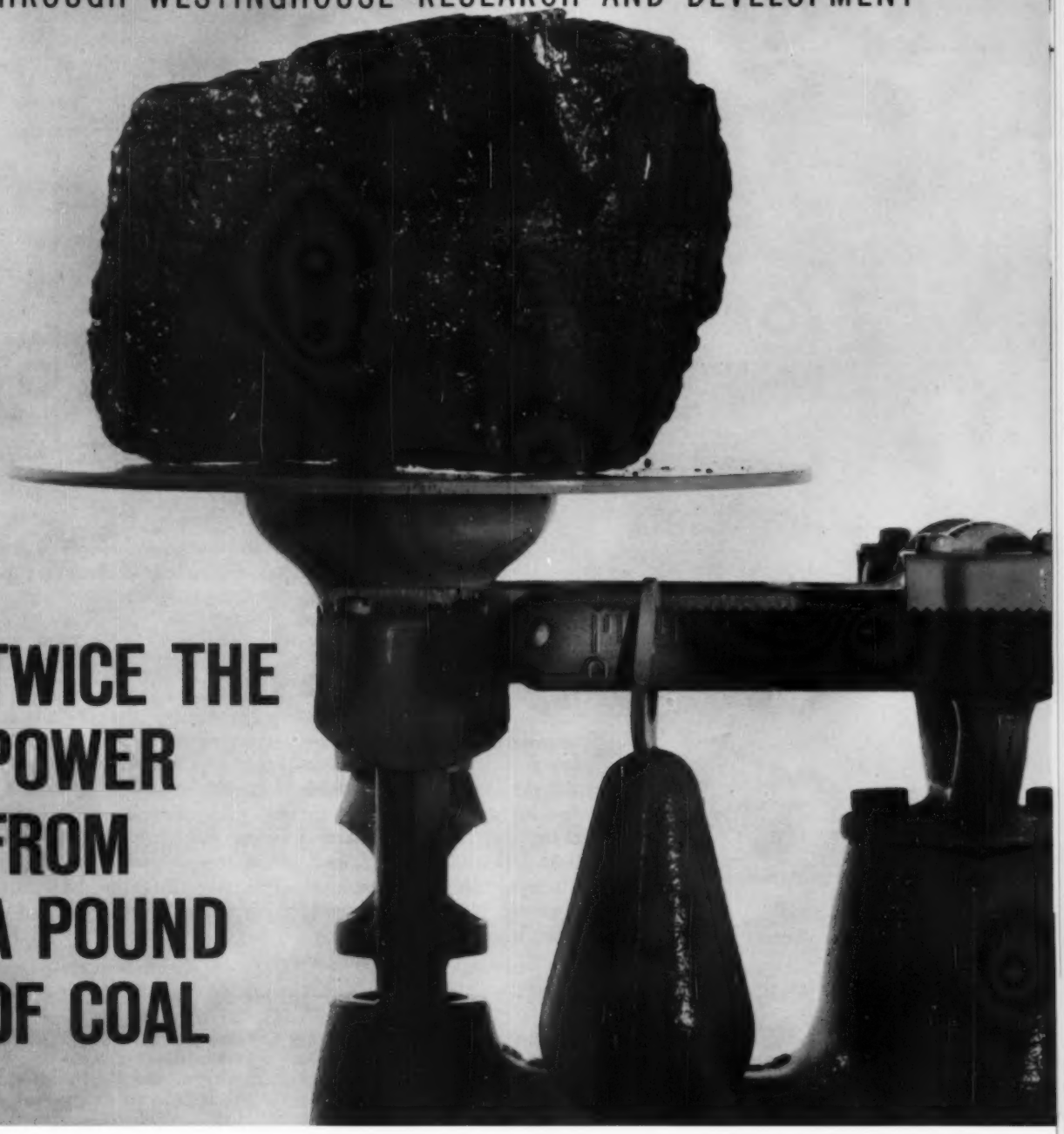
Company	Percent Decline
Savannah Electric & Power	15.8
Central Maine Power	12.2
New Orleans Public Service	12.2
Kingsport Utilities	11.1
Lynn Gas & Electric	9.6
Cincinnati Gas & Electric	7.5
Tucson Gas Electric Light & Power	7.5
Missouri Public Service	6.5
Portland General Electric	6.5
Columbus & Southern Ohio Electric	5.5

Southern Nevada Power scored the largest percentage increase—40.6%. The company cites rapid growth in the Las Vegas area as a big reason for the gain, and its income statement shows a $330,000 decline in the cost of power. California Electric Power, in chalking up a 33.4% gain, noted that part of the increase was due to the accounting treatment of tax benefits from liberalized depreciation adopted Jan. 1, 1958. Another reason was the unusually dry winter, which led to a big increase in irrigation pumping. Rochester Gas & Electric's 30.6% gain was partially due to a $2.5 million rate hike granted in June 1958. However, the company upped operating revenues by $7.7 million while holding the increase in operating expenses, purchases, and maintenance down to about $2.5 million.

Cuts in interest during construction caused the biggest declines in net. Savannah Electric & Power showed net income 15.8% below the preceding twelve months, but a $360,000 dip in the interest-charged-to-construction credit accounted for the entire decline. Cincinnati Gas & Electric reported the largest dollar decline, but almost $700,000 of the $1.3-million decline could be traced to interest during construction. The company says that initial steps have been taken toward obtaining increased rates to offset continuous inflation of construction costs.

Two companies reported declines in net income for the second year in a row. Central Maine Power stacked a 12.2% decline on top of a 5.7% dip for the twelve months ended June 30, 1958; and Columbus & Southern Ohio Electric reported net down 5.5% after a 14.2% decline for the year-earlier period. Neither company has yet obtained long-sought rate relief. While C&SO has a $3.4 million rate hike currently stalled before a rehearing in the city of Columbus, Central Maine is going forward with plans to appeal a "disappointing" decision by the Maine PUC which granted the company about 30% of the amount it had requested. This hike, said Central Maine, "to a substantial extent leaves unanswered the financial problems the company is facing."

THROUGH WESTINGHOUSE RESEARCH AND DEVELOPMENT

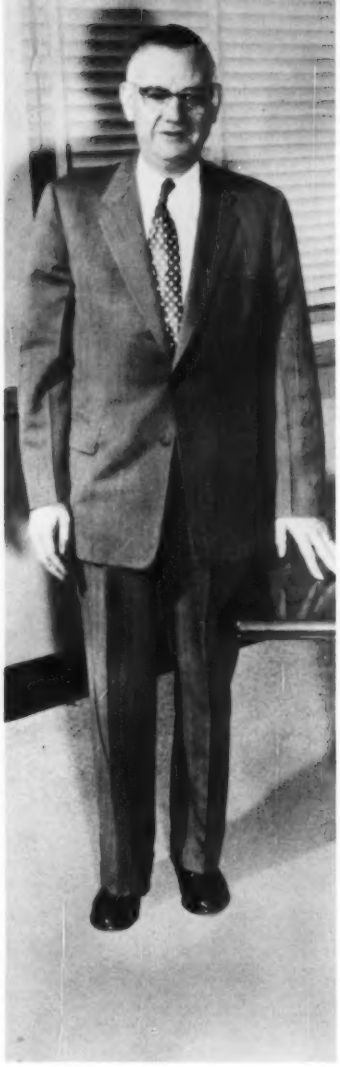


TWICE THE POWER FROM A POUND OF COAL

In the early 1920's, utilities had to use 1½ pounds of coal to produce enough steam to generate one kwhr. Since then, research and development have cut this costly coal consumption by more than 50% . . . and we're getting still more power from that pound of coal every day! In addition to fuel economies, Westinghouse research and development efforts have increased the capacities of generating equipment to the point where today's electric utilities can be equipped to meet power loads of any magnitude in the foreseeable future.

On the next three pages are a few of the advances being made by Westinghouse scientists and engineers to help America's electric utilities meet future power needs even more economically.

YOU CAN BE SURE...IF IT'S Westinghouse



J. R. Carlson,
Division Engineering Manager,
Westinghouse Steam Division

STEAM AT 12 TIMES THE SPEED OF A HURRICANE!

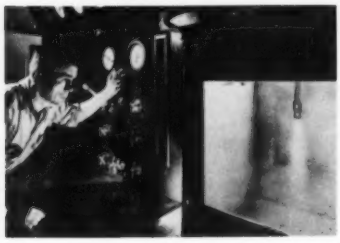
Today's turbine is a controlled storm. As much as two million pounds of high-pressure steam blast through its blades every hour at velocities 12 times faster than a hurricane!

This tremendous volume cools from 1050° F to 80° F in a fraction of a second. The speed of the longest blades is greater than that of sound. Today's steam turbine runs for months without a shutdown for inspection, and 30 to 40 years without replacement. Still, Westinghouse turbine designers are constantly striving for higher temperatures and pressures, stronger materials, and reduced fuel consumption.

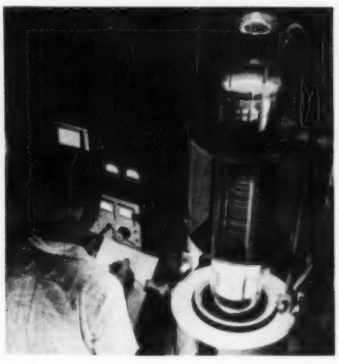
Dramatic progress has been made through Westinghouse metallurgical and design developments. A superpressure element now being built for Philadelphia Electric Company's Eddystone Station will utilize the highest steam temperature and pressure in history—1200° F at 5000 psi! The over-all station heat rate will approach 8000 Btu per kwhr, making this the most efficient power plant in the world.

RESEARCH PROJECTS LIKE THESE ARE HELPING YOU MEET YOUR FUTURE POWER NEEDS ECONOMICALLY

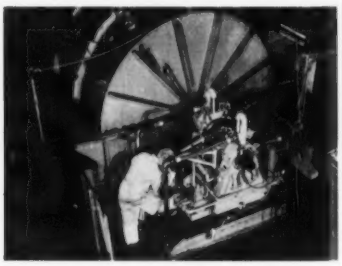
Including a gas turbine and supercharged boiler in new steam turbine installations may increase over-all cycle efficiency 4% or more on large units, 8% on smaller units. Here, a fuel nozzle test stand in the laboratory permits study of optimum fuel-air ratios for combustion.

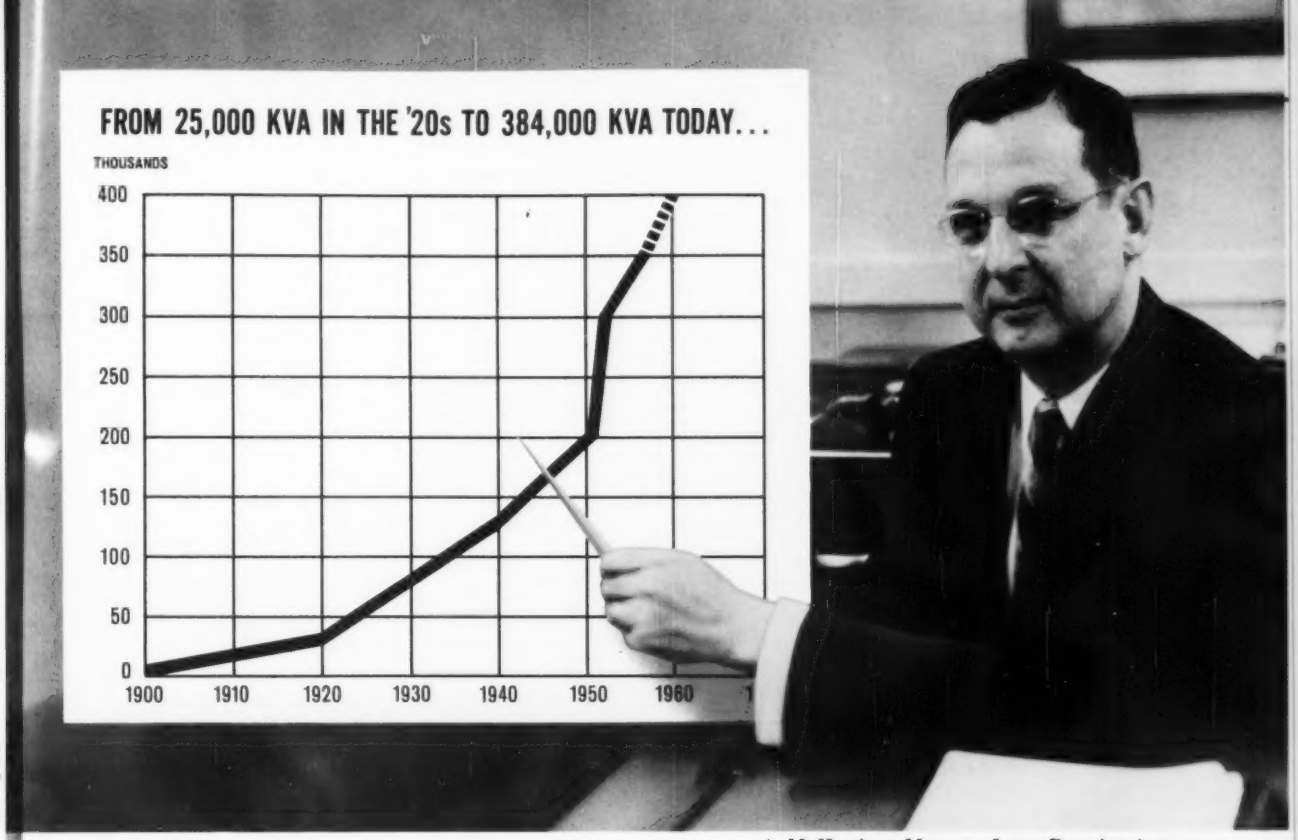


As part of a long-range research program that explores metals for the future, Westinghouse scientists have produced in this furnace an alloy which, at more than 1800° F, is stronger than any other known metal.



Another major development project revolves around this unique low-pressure turbine test facility. Westinghouse engineers use this million dollar test tool on new designs to record performances of low-pressure components under varying operating conditions.





A. M. Harrison, Manager, Large Rotating Apparatus Department, Westinghouse Electric Corporation

. . . AND WE'RE NOW DESIGNING GENERATORS BEYOND THE RANGE OF THIS CHART!

From 1900 to 1920, generators were air-cooled; progress to larger capacities was slow. Maximum ratings of 3600-rpm generators reached only 20 to 25,000 kva. The use of hydrogen as a coolant was the first major break-through. It remained then to increase the pressures of the gas in order to build larger units. As these pressures went from ½ pound up to 30 psi, it appeared that a true maximum had finally been reached—200,000 kva in the early 1950's.

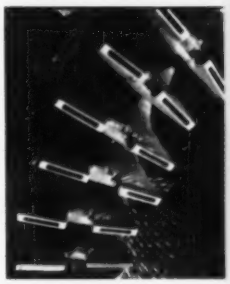
Then, the second big break-through occurred—Inner-Cooling. This permitted unit ratings to increase to the point where, today, the largest single-shaft, 3600-rpm generator unit is rated at 320,000 kva. This unit has been in service for more than two years.

Westinghouse is now building an even larger unit for Arkansas Power & Light Company, rated at a giant 384,000 kva, and is designing generators as much as 30% higher. These may be the largest single-shaft generators required for some time to come, but the end of the line is not yet in sight!

YOU CAN BE SURE... IF IT'S Westinghouse

TWO REVOLUTIONARY WESTINGHOUSE ADVANCES ARE RESPONSIBLE FOR THESE HIGH CAPACITIES

THERMALASTIC® INSULATION—Thermalastic insulation has a unique molecular structure which permits expansion and contraction of windings without injurious deformation throughout the life of the machine. Operating voltages cannot get through the fish-scale barrier of large mica splittings which are locked in a memory-type elastic bond.



INNER-COOLING — This Westinghouse-pioneered system circulates hydrogen through the inside of the rotor and stator windings, providing intimate contact with the conductors where heat originates. Inner-Cooling has doubled single-shaft ratings and has greatly reduced size and weight of equipment.

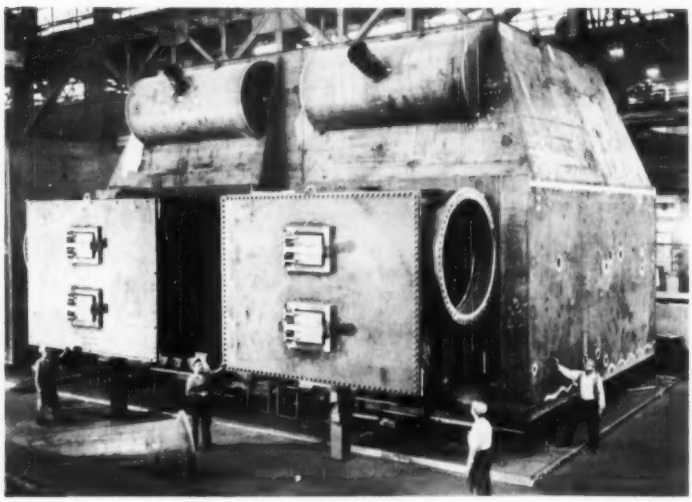
M. A. Nelson, Manager,
Heat Transfer Engineering,
Westinghouse Steam Division

WESTINGHOUSE CONDENSERS GIVE YOU HIGHEST POSSIBLE HEAT TRANSFER EFFICIENCY

FROM RESEARCH AND DEVELOPMENT COME THE MOST ADVANCED DESIGNS

Over the last 50 years, Westinghouse has developed many of the basic condenser designs that today help the electric utility industry to produce low-cost power. Among these advances are the radial-flow principle, air ejectors, steel diaphragms for tube expansion, vertical propeller pumps and reverse-flow valves.

Another significant step was taken with the 150,000-sq-ft surface condenser for the Philadelphia Electric Company's new Eddystone Station. Westinghouse and Philadelphia Electric engineers jointly developed two "firsts" in condenser design.



The detection and location of even the smallest leaks are made possible by 20 sampling compartments in the condenser's upper hotwell and collecting trays below the tube sheets. The lower hotwell is divided into three sections. If the condensate in any section becomes contaminated, it can be bypassed into a water tank for processing before returning to the heat cycle stream.

To protect the condenser from high-pressure and high-temperature steam during start-up or in the event of a trip-out or emergency, the steam is diverted through four injection coolers, which desuperheat the steam and reduce its pressure before it enters the condenser.

JI-50604

RESEARCH DEVELOPMENTS NOW UNDERWAY

LOWER COST FOUNDATIONS—Westinghouse research and development engineers are exploring new structural designs that promise to slash the weight and size of surface condensers and result in lower costs for foundations.

DROPWISE CONDENSATION FOR IMPROVED HEAT TRANSFER — Westinghouse is evaluating water repellents which show promise of keeping the tubes nonwettable *throughout the life of the condenser.* This will result in improved heat transfer rates . . . and permit a great reduction in the size, weight and cost of condensers.

REDUCTION OF AERODYNAMIC LOSSES—Westinghouse engineers are probing means of reducing all the interrelated causes of aerodynamic losses in the transition section between the turbine and the condenser. This will result in design changes that will give the industry condensers that are not only smaller, but more efficient.

MATERIALS FOR LONGER LIFE—In the Westinghouse Steam Development Laboratory, engineers are busy studying ways to prolong the life of waterboxes and pump components by utilizing newly available materials and protective coatings.

Westinghouse turbine, generator and heat transfer consultants are available at any time to discuss your power generation needs with you. Contact your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

Motel Owner Finds Electric Heat Is Best

After experience with several types of heating for motel units, the owner of Town & Country Lodge near Wichita, Kan., chose resistance-type electric heating when he built 24 new motel units recently.

His reasons:

1. Attractive promotional rates offered by Kansas Gas & Electric Co.

2. He wanted the best of everything, including heating.

Town & Country's original 28 units were heated with a hot water and chiller system, gas fired. The problem was when one motel unit was occupied the entire system had to be operated. If one part of the central system went out of order the whole motel had to be shut down. Also, the heating system occupied space that could have been used for an additional motel unit.

However, when a second group of 24 units was installed the units were equipped with window-type heat pumps with 1,500 w of supplementary resistance heating.

The window type performed satisfactorily but there was noise which was particularly noticeable in the winter. Also, tenants "played" with them too much.

So the 1,500-w heating units were changed to 4,000. The heat pumps are now used for cooling in summer and heating in spring and fall. The 4,000-w units take over during the winter months.

KG&E SALES representative M. M. Shumate (above) sold motel owner Homer R. Mosely on electric heating. Utility's attractive heating rate clinched it

The motel's owner, Homer R. Mosely also has a 20-unit motel. It, too, is heated by a hot water system, gas-fired. When 23 units were added recently he installed one-ton window-type air conditioning units and 4,500-w wall-type heating units with blower fans.

Initial cost of this type of installation was less than the gas-fired system used before. Estimated cost of operating the electric equipment was $1,200, with a good insulation job, compared to $500 for the gas-fired system.

But, owner Mosely was willing to pay the difference in return for the safety, cleanliness, convenience, flexibility of operation, and initial savings of electric heating. Also, the central chiller-hot water, gas-fired, system, occupied the space of one additional motel unit.

The new, electric installation has one new twist. Air conditioning and heating equipment are on the same wiring. They are operated by throw-over switches which prevent the operation of one while the other is going. This limits the load on the wiring and avoids conflicting operation of heating and cooling.

Survey Shows 70,308 Medallion Homes To Go Up Next Year

Over 14% of all new homes built in America next year will be Medallion Homes, a nationwide utility survey conducted by the Live Better Electrically project shows.

Of the 300 electric utilities now sponsoring local Medallion Home programs, 165 reported that 568,-268 new homes will be built in their service areas next year. Of these, 50,301 will be Bronze, and 20,007 will be Gold Medallion Homes.

The Gold Medallion Homes will be electrically heated, in accordance with the prescribed standards, and 124 utilities reported they are conducting electric home heating promotions.

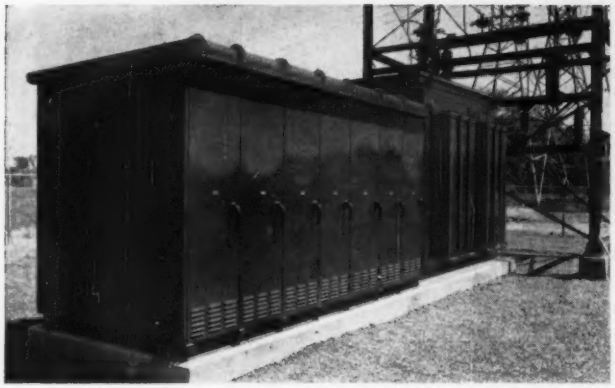
The Bronze Medallion Home averages 10,997 kwhr per year, and the Gold Medallion home averages 21,522 kwhr, according to the survey. In comparison, the average American home uses 3,470 kwhr.

Other results show:

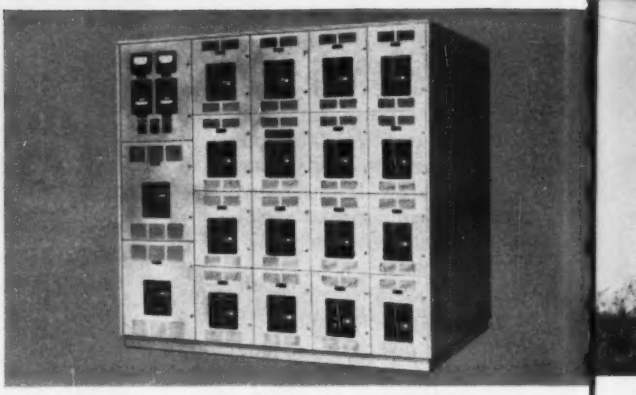
- 101 utilities now award or plan to promote Medallion modernization of existing homes
- 5,025 home builders are participating in the program
- Utilities will certify 32,414 Bronze and 11,825 Gold Medallion Homes during 1959
- A total of 529,063 homes will be built this year within the territories of the surveyed utilities.

I-T-E CIRCUIT BREAKER COMPANY

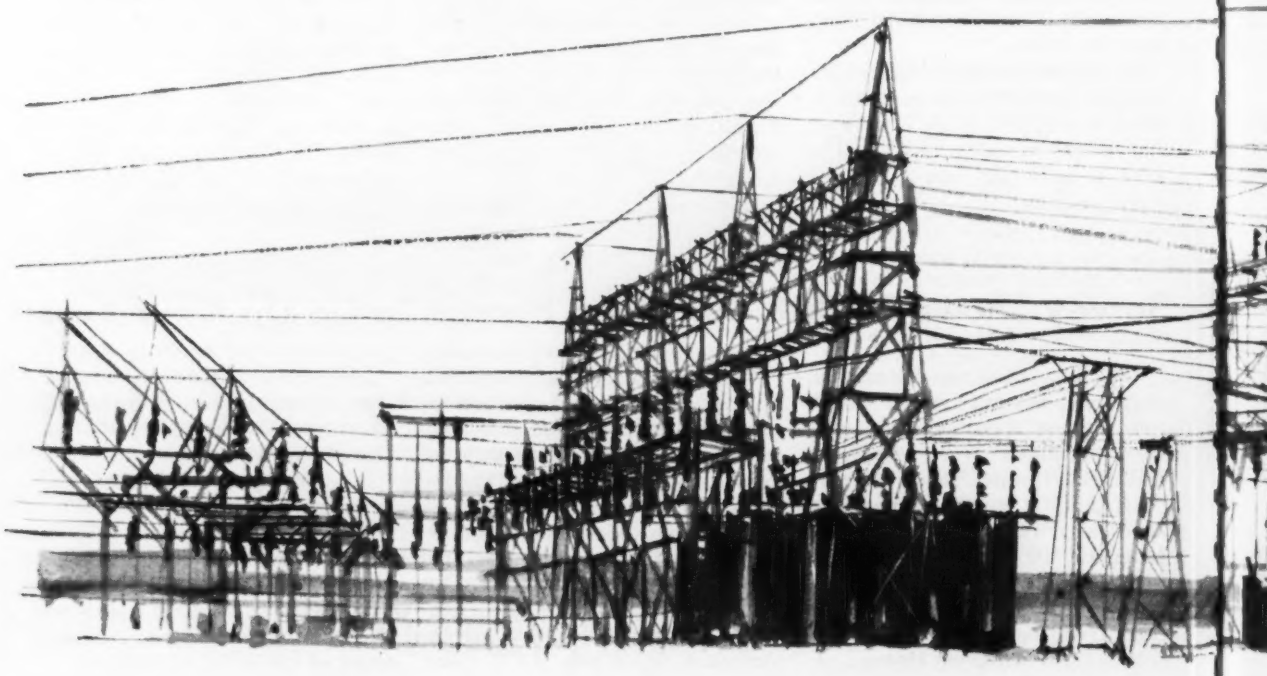
EFFICIENT



Custom designed at no extra cost. I-T-E primary unit substations are designed and built to meet your exact power, space and future expansion requirements. Transformer and switchgear sections are constructed in the same plant to assure smooth coordination of components, easier assembly, pretested performance and delivery to match your own construction schedule. Available in all standard kva ratings and secondary voltages to 13.8 kv.



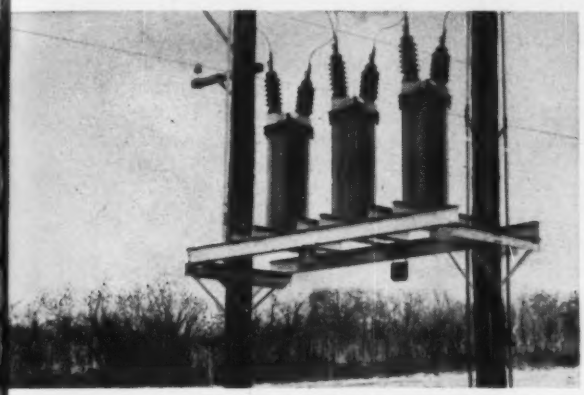
Easily adjusted for higher loads. Expanded calibration over-current trip device on I-T-E K-LINE low voltage switchgear provides maximum load flexibility and service continuity. Greater range saves costs of new trip devices. Manual quick-make closes contacts smoothly in only 5 cycles. Breaker can be moved from connected to test to disconnected position without opening door.



At I-T-E, substation structures are designed and fabricated in the same plant . . . under one responsibility. Once the single-line diagram has been prepared, engineering and manufacturing personnel closely coordinate every step of substation production—from preparation of layout drawings and application of blade switching equipment to the finished and carefully identified structural parts. You benefit from a more efficient design, more efficient use of materials, and virtually rework-free assembly at the installation site.

I-T-E's unified substation service has been meeting the needs of utilities for almost half a century. During this time it has delivered over 100 million pounds of steel substation components. And in 1947 I-T-E solved the problem of excessive maintenance due to corrosive atmospheres by producing the first all-aluminum substation.

The efficient planning and original thinking which are embodied in I-T-E substations are typical of the extra care—extra quality—found in all I-T-E products. Utility men know this from day-to-day experience with I-T-E equipment. And comparing prices shows that I-T-E quality costs no more.



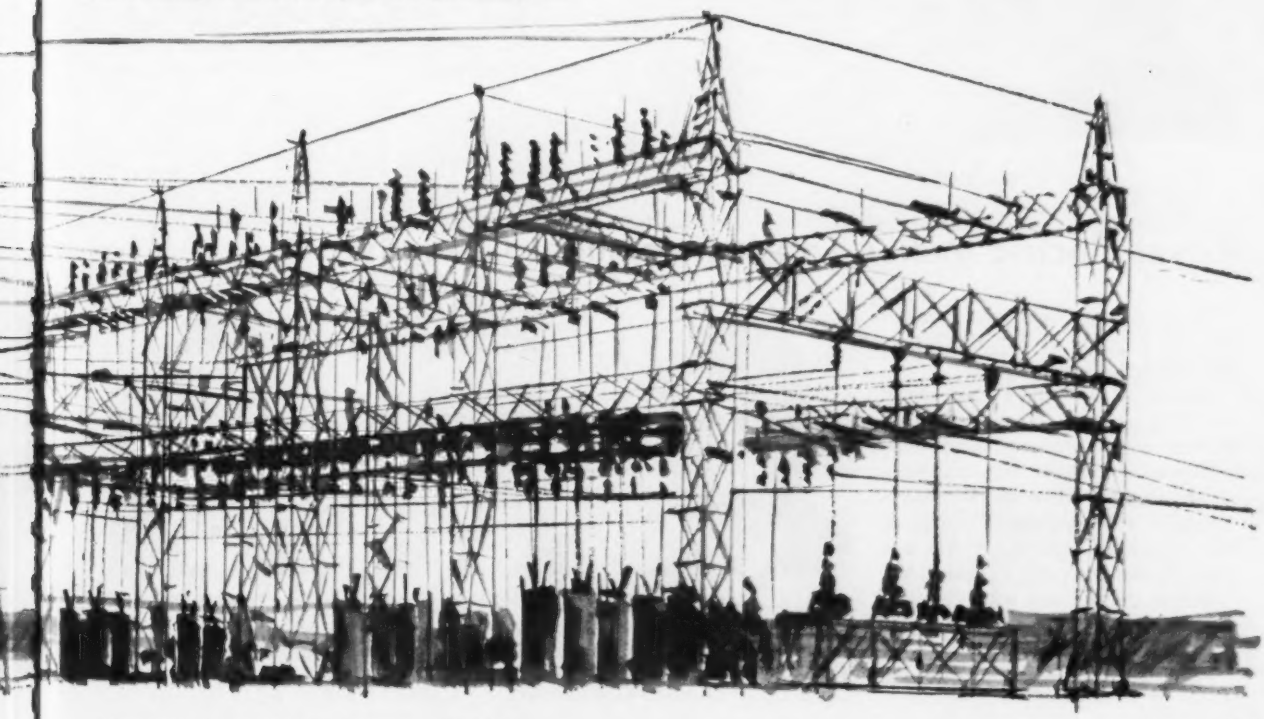
Fastest transient fault protection. I-T-E automatic circuit reclosers improve continuity of service . . . reduce lost revenue from outages. Faults are interrupted within 1½ cycles. Inverse time characteristics coordinate with fuses and protective relays to isolate persistent faults. No auxiliary power supply or control relaying is required. For 2.4 through 46 kv service, up to 400 amperes continuous.

I-T-E Circuit Breaker Company U-2
1900 Hamilton St., Philadelphia 30, Pa.

- ☐ Outdoor substation structures
- ☐ Primary unit substations
- ☐ K-Line LV switchgear (600 v)
- ☐ Automatic circuit reclosers
- ☐ Outdoor air switches
- ☐ Load interrupter switches
- ☐ Distribution cutouts
- ☐ Metal-clad switchgear (4.16 and 13.8 kv)
- ☐ Other _____

Name _____ Title _____
Company _____
Street _____
City _____ Zone _____ State _____

SEND COUPON Get full details on specific I-T-E equipment. And remember I-T-E engineering assistance is always at your disposal.



Colorado Central Names New Vice Presidents

JONES

WILSON

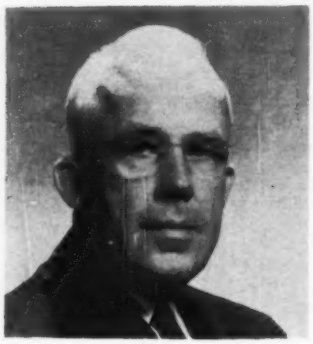
ARMSTRONG

Colorado Central Power Co has named three men to new executive posts: Lee R. Jones to executive vice president; J. E. Wilson to vice president-commercial; and E. G. Armstrong to vice president-finance. F. William Beier was named treasurer.

Jones, who will be in charge of operations, engineering, and construction, joined Colorado Central in 1933. Among his positions have been district manager at Englewood, and, since 1947, vice president of operations.

Wilson joined Colorado Central in 1935 as superintendent of the Arapahoe District. In 1947, he was elected vice president in charge of planning, engineering, and public relations.

Armstrong, who remains as secretary, joined the utility in 1937. He was elected assistant secretary-assistant treasurer in 1939. From then until 1945, he was with Central Louisiana Electric Co, and was elected secretary-treasurer of Colorado Central in 1945.



Brown Elected President of Wagner

George W. Brown has been elected president of Wagner Electric Corp, and will serve as chief executive officer. He was also named president of its subsidiary, Wagner Brake Co Ltd of Canada.

Brown, who joined Wagner as a student engineer in 1926, served in various engineering capacities until 1937 when he was appointed personnel director.

In 1952, he was promoted to executive engineer, and in 1954 was elected vice president in charge of manufacturing, engineering, purchasing and industrial relations. He was elected director of the corporation in 1956 and executive vice president in 1958.

Royal Electric Makes Top Management Changes

Three top management changes have been made at Royal Electric Manufacturing Co.

Joseph R. Warren has been named president. He will oversee all company policies and operations.

Edward J. Gessner, who has been elected vice president and secretary-treasurer, will continue in charge of the accounting department. He was formerly the company's controller.

Before that he was with Pennsylvania Sling Co, and Cobb Wire Rope & Supply.

James L. Warren was elected vice president and plant manager. He will continue in charge of all production and plant operations.

J. R. WARREN

GESSNER

J. L. WARREN

(*More News About People on p* 122)

New identification ridges help you pick the right ALCOA CLAMP—every time

An added means of quick, positive identification is now an integral part of Alcoa's series 480 clamps . . . new identification ridges to tell you instantly—by sight or by touch—the right clamp for the right job.

Here's how it works: on each side of the clamp—and the top and bottom—are identification ridges. The number of ridges on each side of the clamp corresponds to the groove size on each side of the clamp. Pick the groove . . . 1 ridge (2-3/0), 2 ridges (3/0-397.5mcm), 3 ridges (397.5-715 26/7). Then by glance or by feel—you *know* you have the right clamp for the job.

Alcoa heavy-duty clamps with universal groove design provide many other advantages which make them your best buy: exclusive "breathing" action for good conductor contact, regardless of thermal changes . . . extruded aluminum for greater strength . . . longer length for more contact area . . . no loose parts . . . can be applied without being taken apart . . . and just three groove sizes cover the conductor range from #2 to 715mcm 26/7 ACSR . . . stranded from #2 to 800mcm.

Next time and every time, call Alcoa. Put the benefits of Alcoa clamps and accessories into your installations. Aluminum Company of America, 2110-H Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and the Emmy Award winning "Alcoa Theatre" alternate Mondays, NBC-TV

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA
STEEL & WIRE CO., INC., Muncie, Indiana

PERSONAL BRIEFS

M. M. Noa named supervisor of transmission for Gulf Power Co.

A chemical engineer, **Frederick W. Braun,** has been added to the Pacific Power & Light Co's research department to head industrial utilization research of the chemical industry's raw materials available in the company's service area, plus working with chemical and petroleum companies that might become new local industries.

Carl T. Bremicker, vice president in charge of sales of Northern States Power Co, was elected chairman of the North Central Electrical League.

Metropolitan Edison Co promoted **Hugh E. Bodden** to superintendent of the power plant at Middletown, succeeding **H. J. Crawford,** retired.

These personnel changes have been made at Virginia Electric & Power Co: **W. Bruce Vaughan, Jr,** to manager of Vepco's Woodstock, Va., office; **Calvin T. Lucy, Jr,** to supervisor-employee training and information at Richmond, and **Hugh A. Danner** to estimating supervisor, electric distribution department, Norfolk.

Three organizational changes have been made in the Central Division of the Kentucky Utilities Co: **John Hill Bailey** to assistant division manager; **O. C. Seevers** to division engineer, and **Harry D. Stafford** to district manager.

Frederic L. McMullen retired as foreman at the Eaton plant of the Mississippi Power Company.

M. L. Clough joined the management consulting staff of Ebasco Services, Inc.

Karl F. Bader has retired as vice president and secretary of Illinois Power Co. He will continue to be a member of the board of directors of the utility.

Duke Power Co named **P. Allen Fry** assistant electrical superintendent of the Spartanburg district office.

(*More News About People, p* 124)

Adds years of service life to old poles

Treated wood poles as offered by the wood preserving industry are one of the best investments a utility can make. Protect this investment with a planned pole inspection program and ground-line treatment with Chapman Pol-Nu to replace normal preservative depletion.

POL-NU is a superior grease-type preservative containing a full 10% PENTAchlorophenol. Performance records indicate proper treatment should result in at least 15 years of additional pole life. Economy of treatment is achieved through use of the Pol-Nu Bandage-Maker, illustrated below.

Uniform, accurately measured coating of Pol-Nu is automatically applied to paper backing to form a pole bandage of required length as needed, in the field.

Preservative bandage is wrapped around the cleaned pole, may be applied immediately without waiting for wood to dry.

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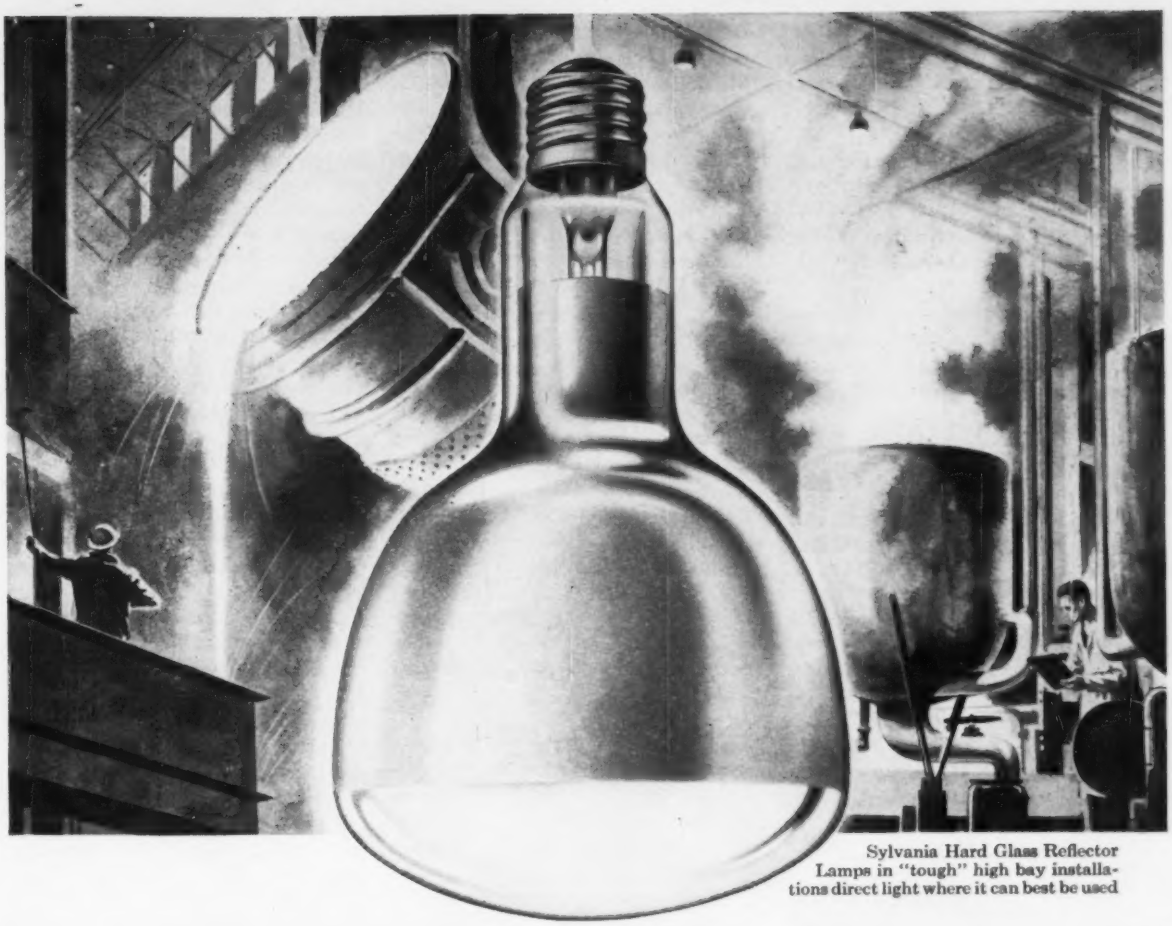

Sylvania Hard Glass Reflector Lamps in "tough" high bay installations direct light where it can best be used

For your toughest lighting jobs . . .

New Sylvania Hard Glass Reflector Lamps resist thermal shock!

Here are incandescent bulbs specially developed for high bay industrial lighting in foundries, steel mills and other "tough" installations. They are the new Sylvania heat-resistant Hard Glass Reflector Lamps.

These new tough-job lamps increase protection against breakage due to thermal shock and high moisture conditions.

With a rated life of 2000 hours, Sylvania Reflector Lamps offer more than twice the service of ordinary incandescent bulbs of the same wattage. Their longer life cuts in half the labor costs for lamp replacement.

Sylvania Hard Glass Reflector Lamps are available in 500, 700 and 1000-watt sizes. These are in addition to the Standard (Soft Glass) Reflector Lamps in 500 and 750 watts for 120, 125, 230 and 250 volts.

For further information and free literature, call your Sylvania supplier or write:

SYLVANIA LIGHTING PRODUCTS
Dept. 9L-7608, 60 Boston Street, Salem, Mass.
In Canada: Sylvania Electric (Canada) Ltd.
P. O. Box 1190, Station "O", Montreal 9

SYLVANIA
Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

Philadelphia Electric Co appointed **Edward W. Carson** manager service operations department, succeeding **R. Z. Zimmermann,** who retired.

Community Public Service Co transferred **Joe H. Cureton** from its Western Division to its Northeast Division as division engineer, succeeding the late **Owen Hull.**

Martin E. Whelan was appointed chief internal auditor of Los Angeles Department of Water & Power succeeding **Paul W. Bucks** retired.

Burns and Roe, Inc. elected **Judson G. Hyde** controller.

Yankee Atomic Electric Co names the following men who are to make up the operating personnel at the atom-powered generating plant at Rowe, Mass., in 1960: **Glenn A. Reed,** plant superintendent; **Carroll E. Haseltine, Jr.,** chief engineer; **Walter J. Miller,** technical manager; **J. Edward Howard,** reactor engineer; **David A. Hansen Jr,** control engineer; **Louis H. Heider,** chemical engineer; and **Alfred E. Davies,** maintenance supervisor.

Puget Sound Power & Light Co made **William B. Bonnett** assistant division manager and **Orland G. Hunt** sales manager.

C. O. Lietzow was promoted to superintendent of heavy maintenance at Toledo Edison Co. **R. E. Blanchong** was named to replace Lietzow as heavy maintenance engineer.

Monongahela Power Co promoted the following: **Ellis Vest,** Morgantown manager, to special representative in the executive department at Fairmont; **John A. Freeman** to Morgantown to replace Vest in an acting capacity; **John A. Poling** to Fairmont in an acting capacity as Freeman's successor as division commercial supervisor.

Duquesne Light Co appointed **John W. Francis** western district engineer, transmission and distribution department.

The Western Pennsylvania Chapter of the Society of Industrial Realtors selected **Philip A. Fleger,** chairman of the board and president, Duquesne Light Co as outstanding industrialist for the year 1959.

Hollis N. Hugins, superintendent of Connecticut Light & Power Co's Devon steam plant, has been designated superintendent of the utility's Norwalk Harbor station, now under construction. **C. Raymond Watts,** superintendent at Montville plant, succeeds Hugins at Devon. **Gerardo J. Lanzolatta,** assistant superintendent at Devon, becomes superintendent at Montville. **V. C. Cole** is production superintendent for the system, headquarters at Berlin.

Leeds & Northrup Co announced the appointments of **Edwin D. Scutt** and **S. Byron Morehouse** to the new positions of assistant to vice president—marketing.

Robert H. Chittim advanced to handle special administrative assignments in mill sales at Chase Brass & Copper Co's Waterbury, Conn., headquarters. To replace him as product manager-tube and fittings at Waterbury, **Payne C. Barzler, Jr,** has been promoted from his previous position as district manager of the Chase branch at Houston, Tex. Barzler has been succeeded at Houston by **Homer D. Cebauer,** formerly a resident salesman for Chase at Tulsa, Okla.

Bucyrus-Erie Co appointed **Jackson R. Fitzgerald** as works chief industrial engineer at South Milwaukee, Wisc.

These personnel changes have been made at Westinghouse Electric Corp recently: **Harold L. Russo** to manager of an Italian nuclear reactor project at the atomic power department; **Burton H. Piper** to North Pacific district manager of engineering and service; **Philip N. Ross** to general manager of the Bettis atomic power laboratory; **John A. Garvey, Jr,** to tax counsel, planning and special projects; **Bruce A. Everly** to manager-marketing for the Lighting Division.

These personnel changes have been made at Line Materials Industries: **Leroy Peppey** to the newly-created position of planning engineer-distribution apparatus, and **H. R. Rowe** to manager of capacitor sales and service.

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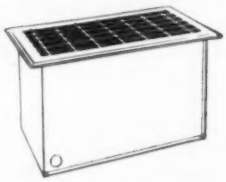
EASY TO INSTALL—SAVES MAN HOURS

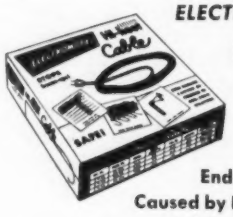
No Separate End Caps—Easy Access to Wireway Only 2 Assembly Screws—Snap-on Front Panel

ELECTROMODE FLOOR INSERT Electric Heater



Specifically engineered to supply safe and efficient heat in areas where it is not practical or possible to install any other type of heater. Mounts flush with floor, causing no obstruction in front of windows or in passageways. Has Electromode exclusive Safety Grid and safety switch. May be installed in wood or concrete slab floors.

ELECTROMODE Hi-heet automatic Cable



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Also HI-Heet Automatic tape with Built-in Thermostat for positive protection against freezing of Water Pipes-Drain Pipes-Oil Lines-Mobile Home Plumbing-Farm Waterers, etc.

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Public Service Electric and Gas Co. Turns Fly Ash Problems Into Profit

By using Fuller pneumatic conveying systems, the Sewaren Generating Station of Public Service Electric and Gas Company, New Jersey, was able to collect 4100 tons of fly ash during 1957. Not only did this eliminate a serious disposal problem that formerly contributed heavily to operating costs . . . it also gave the utility which sold the collected fly ash, a new and valuable source of income.

The Fuller-Kinyon system at Sewaren collects and carries the fly ash to two storage silos that have a combined capacity of 380 tons. It is then either bagged in 50-lb. lots or transferred in bulk through a Fuller loading-out silo spout to tank trucks or covered dump trucks. Labor and equipment costs are kept at a minimum. Dusting is avoided, and high tonnages are handled easily over considerable distances. Extra handling flexibility is provided by a Fuller two-way diverting valve that permits unsuitable fly ash to be pumped directly to an ash reject tank instead of to storage.

Fuller pneumatic conveying systems can be installed almost anywhere at minimum costs, regardless of plant conditions. Moisture and dirt cannot enter the system and material cannot escape. Write today for detailed information in Bulletin FF-49-1. 1334 G-282

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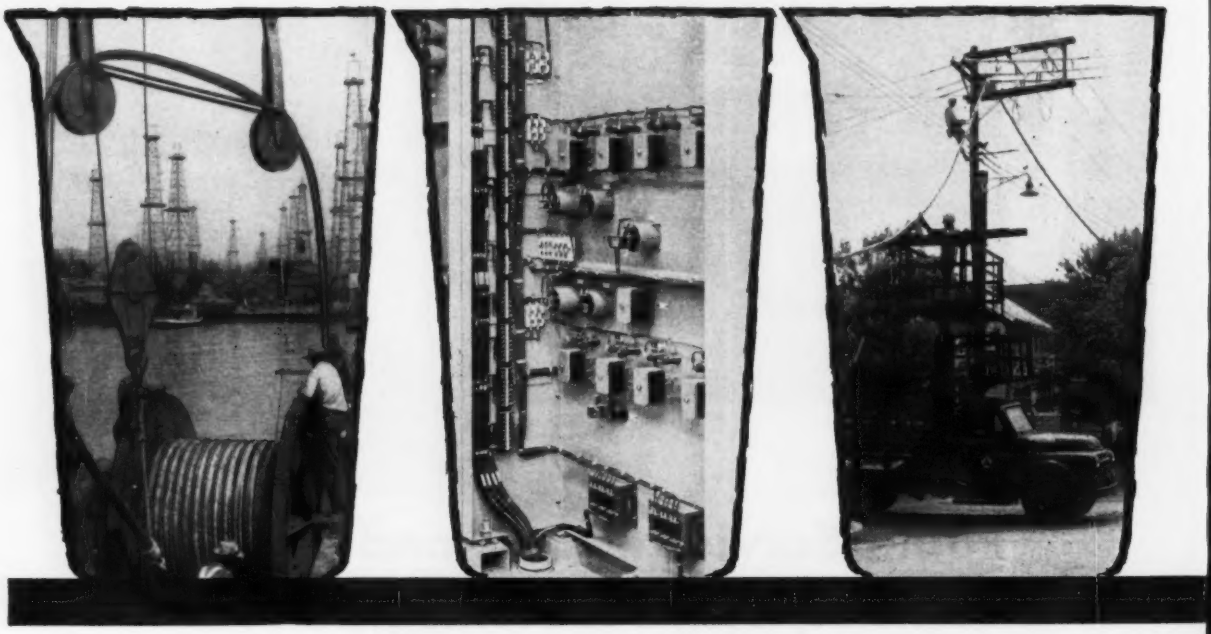
PREMIUM QUALITY INSULATION COMPOUNDS



AQUASEAL

low SIC, superior, rubber compound that is heat and water resistant, used on single and multiple-conductor cables at ratings up to and including 2KV a-c or d-c. Recommended for dry, alternately wet and dry, and continuously wet locations, subject to a-c or d-c potentials at either polarity, and at a maximum conductor temperature of 75C.

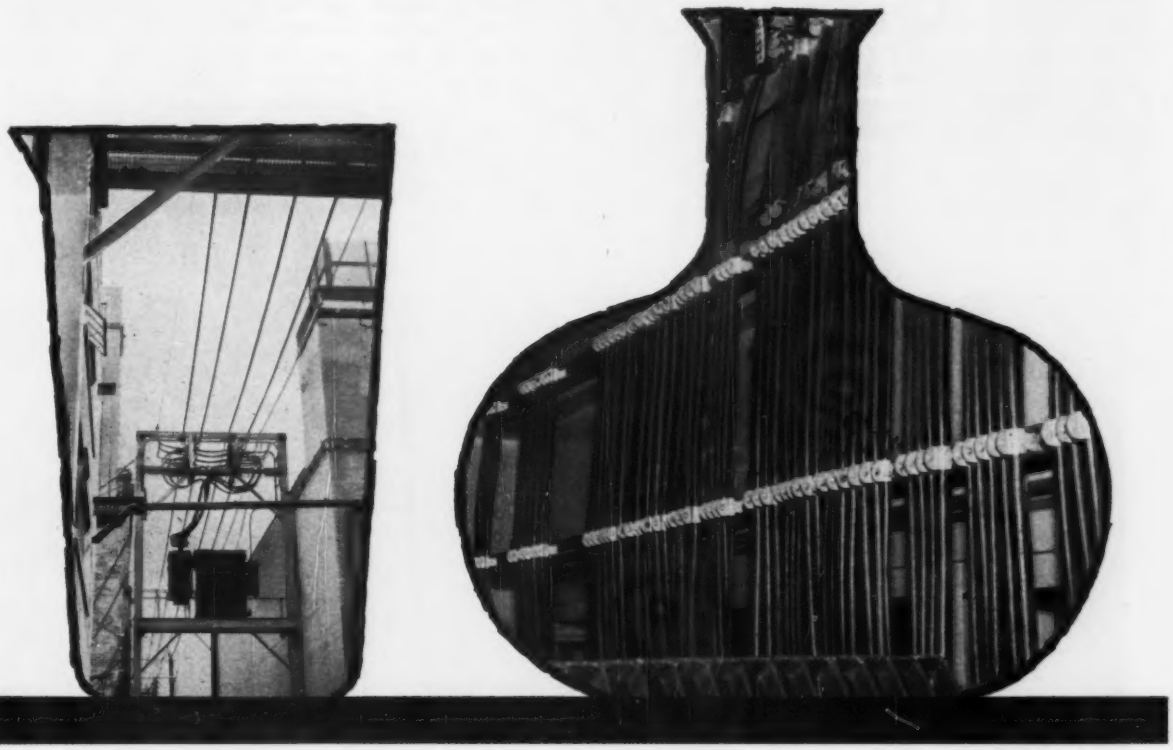
GENCORONE

high-voltage, ozone-resistant insulation of the oil base type, with exceptional physical and electrical stability. Resists the effects of moisture, sunlight, weather and earth solutions. Permits liberal current ratings consistent with maximum continuous operating temperatures of 75C for 8KV service or lower and 70C for higher voltages.

BUTARONE

high-voltage, butyl-base compound with exceptional resistance to ozone, low water absorption, and excellent resistance to heat. Suitable for both low and high-voltage applications, it has excellent electrical stability and resistance to aging. Operates at 90C up to 5KV and at 85C at higher voltages.

In the modern General Cable laboratories, some of America's foremost rubber chemists create, test and evaluate new insulation compounds in a continuous program of research and development. Materials for standard service conditions and special constructions to satisfy unusual requirements have all proven their worth in superior performance in power and control cables over many years. A few of the basic compounds from General Cable's long list are briefly described on these pages.



THERMAX-W

and many other compounds in the rubber group are available for low and moderate voltage power cable service in wet locations, where high temperatures are encountered or where high current carrying capacity is required.

GENCASEAL (PVC)

in the thermoplastic group, as well as high-molecular-weight polyethylene, which is another outstanding General Cable thermoplastic insulation.

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A $320 Million Denial

After a House subcommittee tabled the proposal for joint development of the Trinity River Project, here's what Pacific Gas & Electric Co's Robert E. Gerdes had to say:

"This action is unfortunate for the taxpayers of federal, state and local governments, because the public treasuries now will be denied $320 million in taxes and net project revenues over the Trinity repayment period. Moreover, $60 million will be added to government expenditures, mostly within the next two fiscal years, at a time when eliminating such unessential spending is so important for trimming the federal budget and stemming the tide of inflation."

The utility's executive vice president expressed disappointment over rejection of its partnership proposal, but said PG&E will cooperate with the project.

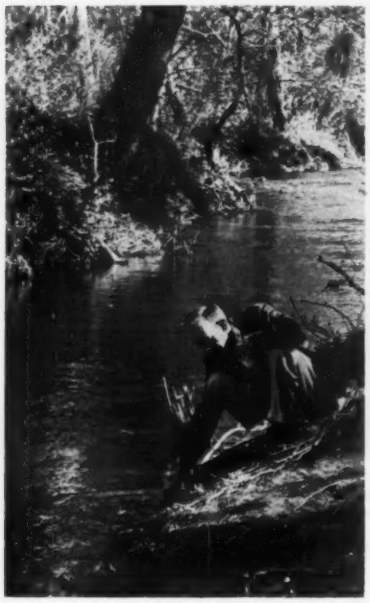
KG&E To Build Area

Kansas Gas & Electric has established a new department to assist southeast Kansas communities to stimulate growth, according to Gordon W. Evans, KG&E president at Wichita. This new effort will be under the direction of George E. Billings, former managing director of the Port Huron, Michigan, Industrial Development Corporation.

Private Power Preferred

Puget Sound Power & Light will fight the announced intention of Tacoma City Light to acquire its facilities in the 21-sq mi area between Tacoma and Seattle known as Federal Way.

According to Henry R. Kruse of Olympia, Puget's division manager, 75% of Puget's customers have requested the company not to dispose of any of its properties or terminate any of its services, and to resist any attempts of Tacoma City Light to construct duplicating lines. Of the other 25%, only 1.1% have expressed a preference for Tacoma City Light. There are presently some 1,892 customers in the area.



By sampling its streams . . .

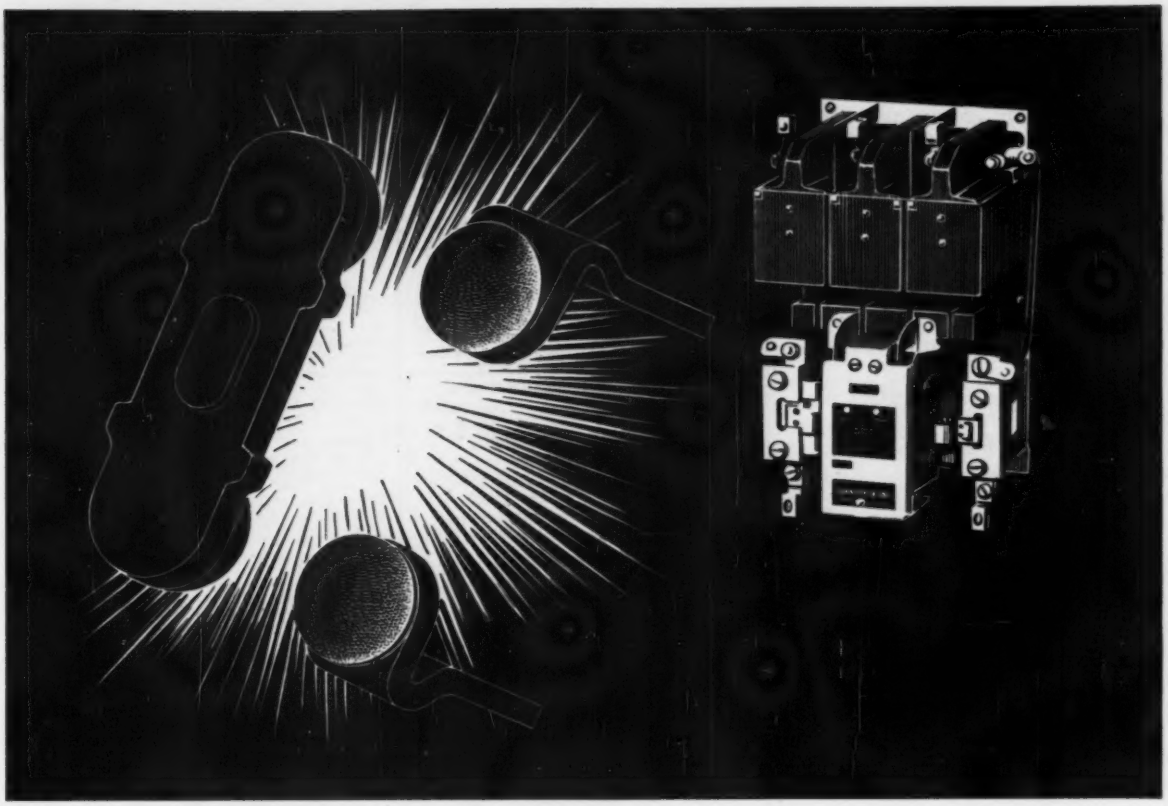
So this angler will know where to find the big ones . . .

Pacific G&E Tells One Fish Story That the Public Likes

Every week on Thursday Pacific Gas & Electric Co issues its "Stream Conditions for the Fisherman" to newspapers, radio stations, sporting goods stores and automobile clubs in California. The report, which reaches about two million anglers, tells about stream conditions in the Sierra Nevadas and other parts of the state where PG&E maintains hydro facilities.

From the time the trout season opens in late April or early May, until it closes in October, the company's employees act as a scouting network, reporting on water conditions as they affect fishing. Game wardens and hotel operators also report conditions to PG&E.

The bulletin is only one part of the giant utility's service to fishermen. It also regulates the flow on its hydro system to accommodate the pole-and-fly species, and once helped save a king salmon run by releasing water into an almost dry river bed. One thing, however, it will not do: It won't guarantee you'll catch a thing.



For Dependability in Power Contactors Specify Mallory Contacts

It pays to be particular about the contacts that go into the motor controllers, line starters and power contactors you buy. The reliability of this type of equipment . . . and of any other circuit-switching device . . . depends considerably on the contacts used in them. Just "any good contact" isn't good enough for this service.

For the special requirements of power contactors, Mallory has developed a series of silver-cadmium oxide materials with unusual properties. They are unequalled in their resistance to welding . . . will take several times the current that would weld fine silver contacts of the same size. They have low contact resistance which results in low temperature rise in high current circuits. These materials withstand the heavy arcing and severe duty cycles characteristic of motor control service, showing low rate of arc erosion and wear.

A unique Mallory development, silver-cadmium oxide contacts are the choice of leading contactor manufacturers. They are part of a broad line of materials created by Mallory pioneering in powder metallurgy techniques. Don't settle for less than Mallory quality and performance.

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Metallurgical
- Contacts
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- Welding Materials
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Construction Pace Steady Despite the Steel Strike

Electric utility construction programs appear to be maintaining a steady pace despite the widening impact of the steel strike. Recent surveys (EW, Aug. 3, p 36) and utility announcements tend to bear this out. Most electric utility sources indicate it will be another month before steel stocks will be reduced to a point that might crimp construction schedules.

Progress on projects includes the following:

- Appalachian Power Co is awaiting Federal Power Commission clearance for start of construction of Smith Mountain Dam, a pumped-storage project on the Roanoke River that will cost $45 million. Ultimate capacity will be 320 Mw. Specifications for a rock-fill and arch-type concrete dam have been mailed to representatives of contracting firms interested in bidding.
- The half-way point has been reached on Carolina Power & Light Co's steam station near Hartsville. Three transformers were recently unloaded and set on foundations in only four hours. Near completion is a 5,000-ft dam that will provide a 2,550-acre source of cooling water. CP&L also began heavying up its 20-mi Henderson-Warrenton 132-kv line. Existing conductor will be replaced by over 1-in. dia wire of 45 aluminum strands over seven strands of steel core. Crews have started on a 27-mi Sumter-Kingstree line. The 110-kv link will be completed by the end of the year.
- Walla Walla District of the Corps of Engineers is issuing invitations to bid on 23 jobs totaling over $107 million in the current fiscal year. Contracts will cover phases of work at McNary, Ice Harbor and John Day dams and some flood control work.
- Washington Water Power Co plans to build a $530,000, 66-mi distribution line in Idaho from Grangeville to Elk City.
- Thermal Power Co's progress on steam well drilling finds the California company already prepared to supply more than Pacific Gas & Electric Co's requirements of 250,000 lb/hr for the first unit of PG&E's 12.5-Mw plant soon to be built in Sonoma County.

SEARCHLIGHT SECTION

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3—1500 KVA G-E 69000—2300Y
3—1500 KVA G-E 69000—2400/4160Y
3—1500 KVA G-E 69000—7200/12470Y
4—1000 KVA Mol 7200/12470Y—4160
3—333 KVA W-H 67000/69000—240x480
3—333 KVA G-E 66000—2400/4160Y
1—750/938 KVA G-E 3-Ph. 33000—6900Y—TCUL equip. fan cooling
1—1000 KVA W-H 3-Ph. 33000—7200Y TCUL equipped

Many other items in stock

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Reliable rewind and repair service on all makes of transformers

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This is a job that requires skill, knowledge and ambition, and offers real opportunity for advancement in compensation and responsibilities.

Please send resume to Mr. John F. Konrad, Manager of Investments. All replies confidential.

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RELAY TEST ENGINEER

Excellent opportunity in relay test section of Massachusetts utility. Good knowledge of electronics a necessity. E.E. degree helpful. Salary commensurate with experience. Write resume of experience, education, personal data, and salary requirements. All held in strict confidence.

P-2448, Electrical World
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POSITIONS VACANT

Wanted—Graduate Electrical Engineers—Electric Utility in North Jersey area. Some experience in transmission and distribution desired. Please answer giving education, experience and salary expected. P-2345, Electrical World.

Application and Sales Engineer—Excellent future with leading manufacturer in the electrical field. Applicant should be 28-40 years of age, E.E. graduate, with distribution engineering, construction, or sales experience. Position involves 50% to 60% travel. Salary commensurate with qualifications. Send detailed resume of experience, recent photo. All information will be held in strict confidence. P-2379, Electrical World.

Superintendent of Metering. Graduate EE with minimum 6 years experience residential, commercial and industrial watthour meter testing and maintenance with operating utility. Ability to test, adjust and repair watthour meters, organize and train test personnel, formulate test procedures, establish record system, and specify and purchase meters, test equipment and spare parts is essential. Location Middle East. Salary $16,000 to $18,000 with two year contract and other benefits. P-2440, Electrical World.

General Manager with executive abilities to direct all phases of rural electric system with $9,000,000 investment in steam, diesel and hydro generation, transmission and distribution. Permanent position carrying substantial opportunity for qualified person. Salary open. Write to Miss Dorothy Fisher, Moon Lake Electric Association, Inc., Vernal, Utah, for application blank 328. Completed applications must be received by October 7. Replies confidential.

SELLING OPPORTUNITY OFFERED

Representative wanted for manufacturer of street lighting equipment, pole line specialties. Full particulars. RW-9821, Electrical World.

POSITION WANTED

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The Meeting Calendar

SEPTEMBER

Illuminating Engineering Society—Annual National Technical Conference, Fairmont and Mark Hopkins Hotels, San Francisco, Calif., Sept. 7-11.

National Electrical Manufacturers Association—Codes & Standards Committee, NEMA Office, New York City, Sept 9-10; Program & Budget Committee, Officers Committee, NEMA Office, New York City, Sept. 15; Board of Governors, Hotel Biltmore, New York City, Sept. 22.

Maryland Utilities Association—Annual Fall Conference, The Cavalier, Virginia Beach, Va., Sept. 11-12.

National Electrical Contractors Association—Annual Convention, Waldorf Astoria Hotel, New York City, Sept. 13-17.

• **14th National Conference of the Association for Computing Machinery**—Massachusetts Institute of Technology, Cambridge, Massachusetts, Sept. 13.

Edison Electric Institute—EEI-AGA Accounting Division & Section Organization Meeting, Hotel Cleveland, Cleveland, Ohio, Sept. 14-15; Meter and Service Committee, Hotel Wentworth, Portsmouth, N. H., Sept. 14-16; Industrial Power & Heating Group, Treadway Inn, Niagara Falls, N. Y., Sept. 17-18; Industrial Relations Committee Twelfth Annual Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 21-23.

Electric Companies Public Information Program—Workshop Conference, Warwick Hotel, Philadelphia, Pa., Sept. 16-17.

Northwest Public Power Association—Power Use Workshop, Ephrata, Wash., Sept. 16-18; Accounting and Financing Workshop, Clark County PUD community room, Vancouver, Wash., Sept. 30-Oct. 1.

Seventh Annual Engineering Management Conference—The Statler Hilton Hotel, Los Angeles, Calif., Sept. 17-18.

Public Utilities Association of the Virginias—41st Annual Meeting, The Greenbrier, White Sulphur Springs, Sept. 17-19.

Instrument Society of America—14th Annual Conference and Exhibit, International Amphitheatre, Chicago, Ill., Sept. 21-25.

Third Industrial Nuclear Technology Conference—Sponsored by the Armour Research Foundation and Nucleonics magazine, Morrison Hotel, Chicago, Ill., Sept. 22-24.

Second Electric Utility Seminar—Sponsored by the System Planning Committee of the PEA, Penn State University, State College, Pa., Sept. 23-25.

Missouri Valley Electric Association—Accounting Conference, President Hotel, Kansas City, Mo., Sept. 24-25.

Northwest Electric Light & Power Association—Annual Meeting, Vancouver Hotel, Vancouver, B. C., Canada, Sept. 28-30.

National Power Conference—Sponsored by the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, Muehlebach Hotel, Kansas City, Mo., Sept. 27-30.

• **National Symposium on Telemetering**—Sponsored by IRE, San Francisco, Calif., Sept. 28-30.

• **National Association of Corrosion Engineers**—Western Region Conference, Bakersfield Inn, Bakersfield, Calif., Sept. 29-Oct. 1.

• **Pennsylvania Electric Association**—Annual Meeting, Bellevue Stratford Hotel, Philadelphia, Pa., Sept. 30-Oct. 1.

• **Canadian Electrical Manufacturers Association**—15th Annual Meeting, Sheraton-Brook Hotel, Niagara Falls, Ontario, Canada, Sept. 30-Oct. 2.

OCTOBER

• **Pennsylvania Electric Association**—Meter Committee, Pittsburgh, Pa., Oct. 1-2; System Planning Committee, Galen Hall, Wernersville, Pa., Oct. 12-13; Electrical Equipment Committee, Pick-Roosevelt Hotel, Pittsburgh, Pa., Oct. 8-9; System Planning Committee, Galen Hall Hotel, Wernersville, Pa., Oct. 12-13; Relay Committee, Hotel Alexander, Hagerstown, Md., Oct. 29-30.

• **Edison Electric Institute**—Transmission and Distribution Committee, Rice Hotel, Houston, Tex., Oct. 1-2; Electrical System & Equipment Committee, Hotel Muehlbach, Kansas City, Mo., Oct. 5-6; Prime Movers Committee, Barringer Hotel, Charlotte, N. C., Oct. 12-14.

• Additions this week.

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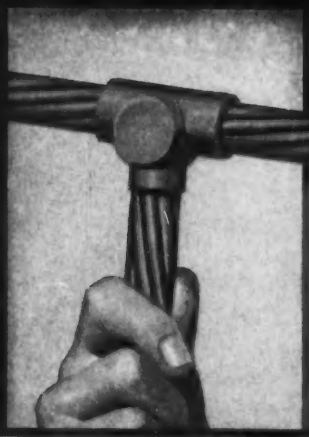

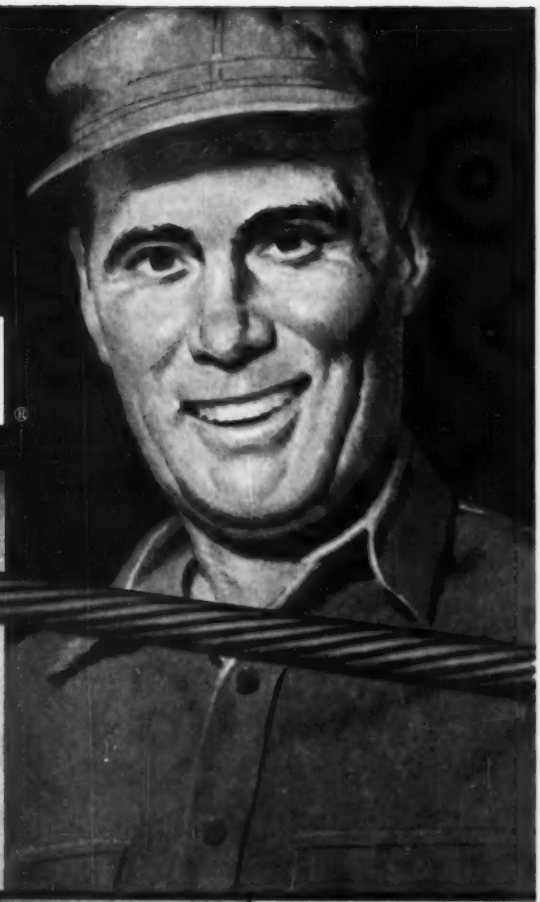

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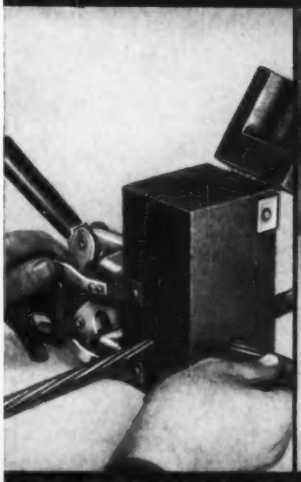

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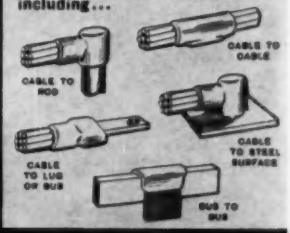

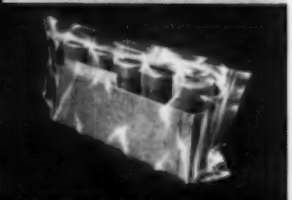

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Electrical Living Policy Committee of Edison Electric Institute reviews Live Better Electrically program for 1960. Left to right: C. M. Wallace, Jr., Georgia Power Co.; P. W. Emler, American Electric Power Service Corp.; J. H. Mead, Southern California Edison Co.; W. M. Shepherd, Arkansas Power & Light Co.; G. W. Ousler, Duquesne Light Co., chairman; E. O. George, The Detroit Edison Co., Chairman, EEI Sales Division Executive Committee; M. C. Albrittain, Baltimore Gas & Electric Co.; C. D. Lawrence, New England Power Service Co.; and J. R. Furber, Northern States Power Co. Absent: Don Willis, Arizona Public Service Co.; Thomas G. Ayers, Commonwealth Edison Co.

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In mapping a program to surpass 1959's, the planners had a difficult task, for among this year's solid accomplishments are—

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